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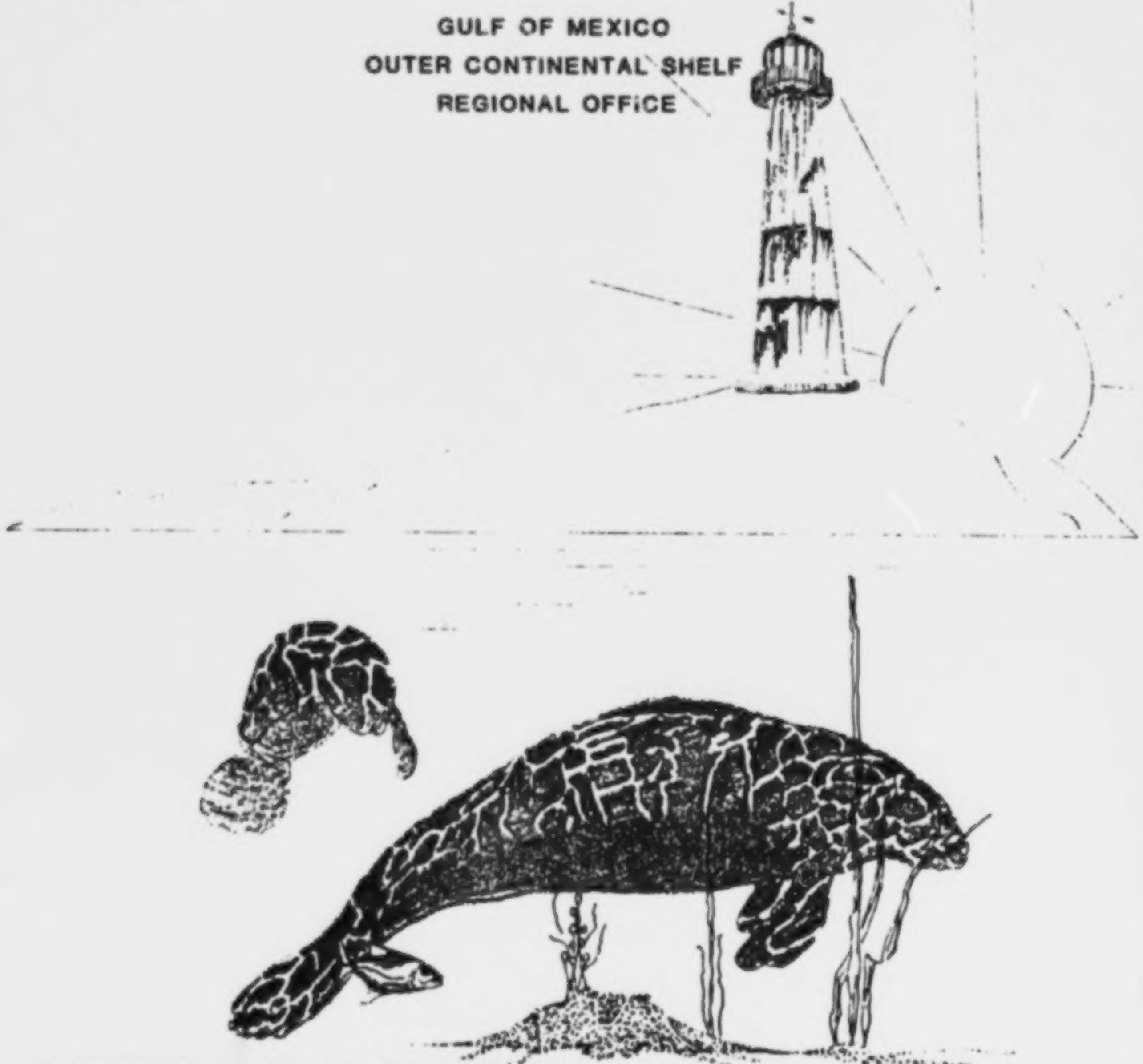
FINAL

AREA-WIDE ENVIRONMENTAL ASSESSMENT

EXPLORATION ACTIVITIES
SOUTHCENTRAL SECTION OF EASTERN PLANNING AREA

GULF OF MEXICO
OUTER CONTINENTAL SHELF
REGIONAL OFFICE



U.S. DEPARTMENT OF THE INTERIOR/MINERALS MANAGEMENT SERVICE

OCS EIS/EA
MMS 86-0005

FINAL
AREA-WIDE ENVIRONMENTAL ASSESSMENT EXPLORATION ACTIVITIES
SOUTHCENTRAL SECTION OF EASTERN PLANNING AREA

Offshore Areas of Charlotte Harbor, Pulley Ridge, and Portions of The Elbow, St. Petersburg, Howell Hook, and Vernon

Prepared by the
MINERALS MANAGEMENT SERVICE
GULF OF MEXICO
OUTER CONTINENTAL SHELF
REGIONAL OFFICE

December 1985

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ABBREVIATIONS AND ACRONYMS

AEA	Area-Wide Environmental Assessment
AQCR	Air Quality Control Region
BOD	Biological Oxygen Demand
BLM	Bureau of Land Management
CEI	Coastal Environments, Inc.
COE	(U.S. Army) Corps of Engineers
CSA	Continental Shelf Associates
DO	Dissolved Oxygen
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
FREIS	Final Regional Environmental Impact Statement
FWS	Fish and Wildlife Service
GOM	Gulf of Mexico
GS	Geological Survey
MAFLA	Mississippi, Alabama, Florida
MMS	Minerals Management Service
NCET	National Coastal Ecosystems Team
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NS	National Seashore
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
POE	Plan of Exploration
SEA	Site-Specific Environmental Assessment
SIC	Standard Industrial Classification
SUSIO	State University System (of Florida) Institute of Oceanography
USDC	U.S. Department of Commerce
USDI	U.S. Department of the Interior
USDOD	U.S. Department of Defense
USEPA	U.S. Environmental Protection Agency

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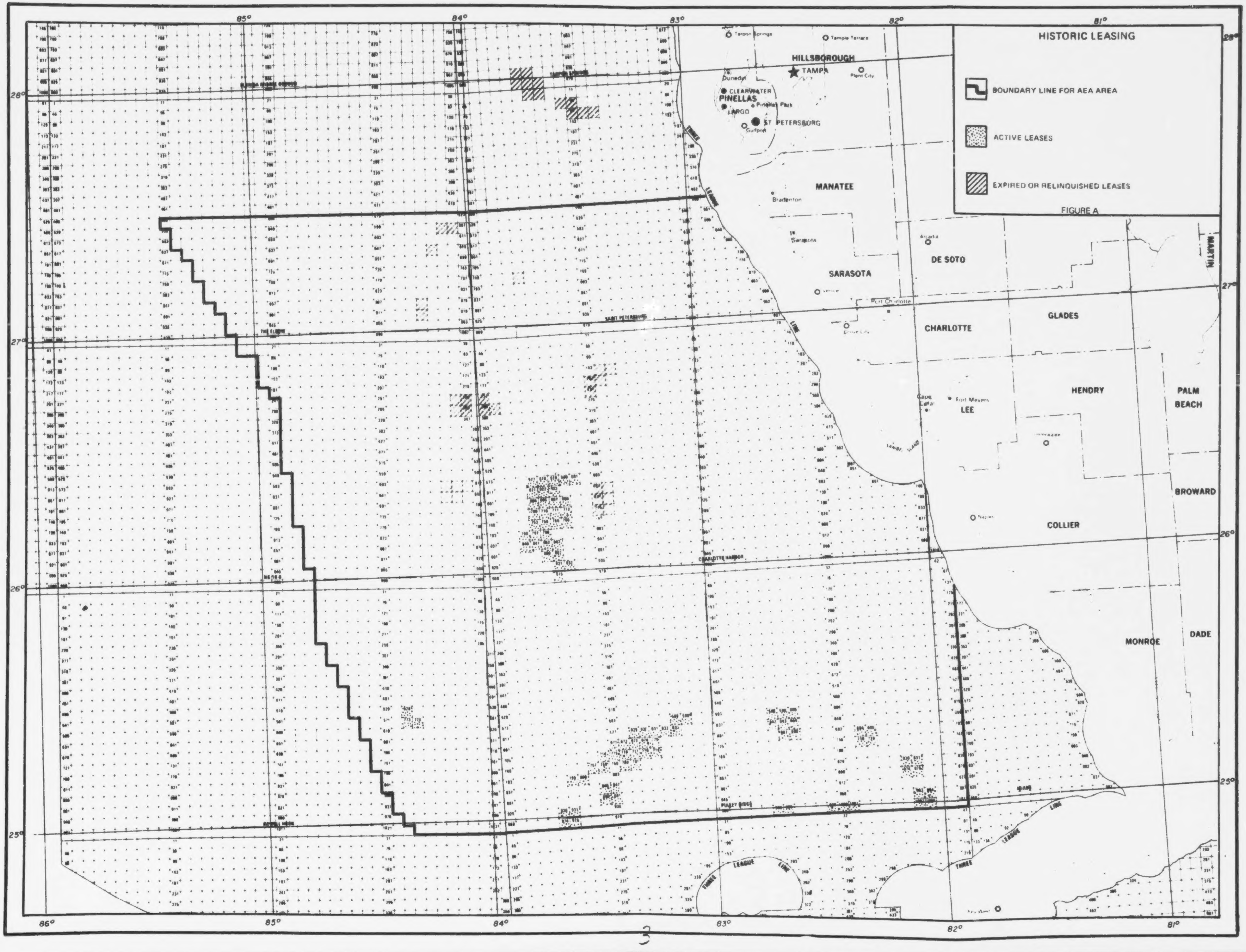
INTRODUCTION

This Area-Wide Environmental Assessment (AEA) has been written for exploratory activity occurring in those blocks of the Eastern Planning Area of the Gulf of Mexico (GOM) Outer Continental Shelf (OCS) contained in the following areas: Charlotte Harbor, Pulley Ridge, and those portions of The Elbow, Howell Hook, Vernon, and St. Petersburg, that lie shoreward of the 1,000m (3,281 ft) isobath to the west of the 81°80'W longitude and north of the 24°90'N latitude. The boundaries for the AEA area and the relationship of the AEA area to the coast are shown in Figure A. This AEA will serve as a base document for exploratory activity proposed within the environmental assessment area. A Site-Specific Environmental Assessment (SEA) will be prepared for each Plan of Exploration (POE) submitted for activities within the AEA area. The SEAs will contain site-specific and updated information not presented in the AEA. Sections of the AEA which will be covered or supplemented in an SEA are indicated throughout the text.

In compliance with the National Environmental Policy Act (NEPA), this AEA/SEA concept implements the tiering process outlined in 40 CFR 1502.20 which encourages agencies to tier environmental documents to eliminate repetitive discussions of the same issue. The SEA will conform to the guidelines for preparing environmental assessments in compliance with the requirements of 30 CFR 250.34 and NEPA using information presented in the base document (AEA). The determination of whether a Finding of No Significant Impact is applicable will be made in each SEA prepared for plans submitted for blocks within the area. Therefore, emphasis on specific conclusions regarding the significance of the environmental impacts of a proposed action will be incorporated into the text of the SEA rather than the AEA.


85°
84°
83°
82°
81°
28°
27°
26°
25°
86°
Tarpon Springs
Temple Terrace
HILLSBOROUGH
TAMPA
Plant City
Dunedin
CLEARWATER
PINELLAS
Pinellas Park
LARGO
Gulfport
ST. PETERSBURG
MANATEE
Bradenton
Sarasota
SARASOTA
Arcadia
DE SOTO
Port Charlotte
CHARLOTTE
GLADES
MARTIN
HENDRY
PALM BEACH
Cape Coral
Fort Meyers
LEE
SANIBEL ISLAND
BROWARD
Naples
COLLIER
MONROE
DADE
Key West
FLORIDA MIDDLE GROUND
TARPON SPRINGS
SAINT PETERSBURG
THE ELBOW
CHARLOTTE HARBOR
PULLEY RIDGE
HOWELL HOOK
THREE LEAGUE LINE
BOUNDARY LINE FOR AEA AREA
ACTIVE LEASES
EXPIRED OR RELINQUISHED LEASES

HISTORIC LEASING

FIGURE A

I. DESCRIPTION OF PROPOSED ACTION

The following sections will be addressed in an SEA.

A. GENERAL

B. EQUIPMENT AND SUPPORT SYSTEMS

C. SCHEDULE OF ACTIVITIES

D. TRANSPORTATION ROUTES

E. PERSONNEL REQUIREMENTS

F. TECHNOLOGY

G. CONTINGENCY PLANS

H. DISCHARGES AND EMISSIONS

1. General
2. Solid Wastes
3. Liquid Wastes
4. Gaseous Wastes

I. STATE CERTIFICATION

J. MEASURES FOR COMPLIANCE

K. NEARBY AND PENDING ACTIONS

Tables I-1 and I-2 provide listings of relinquished or expired leases and active leases, respectively, for the South Central section of the Eastern Planning Area, which is the subject of this AEA. Table I-3 lists the SEAs prepared for exploratory activities within the AEA area and the wells actually drilled. To date, a total of nine exploratory wells have been drilled within the AEA area, but none have gone to production.

Additional information on nearby pending actions will be addressed in an SEA.

Table I-1

Relinquished or Expired Leases
South Central Section of Eastern Planning Area

Lease Area	Block	Lease No.	Lessee
Charlotte Harbor	144	3906	Gulf Oil Corp.
Charlotte Harbor	145	3907	Gulf Oil Corp.
Charlotte Harbor	187	3908	Marathon Oil Co.
Charlotte Harbor	188	3909	Murphy Oil
Charlotte Harbor	221	3910	Marathon Oil Co.
Charlotte Harbor	231	3911	Murphy Oil
Charlotte Harbor	265	3912	Shell, et al.
Charlotte Harbor	266	3913	Shell, et al.
Charlotte Harbor	627	3914	Murphy Oil
Charlotte Harbor	628	3915	Mobil Oil
Charlotte Harbor	671	3916	Murphy Oil
Charlotte Harbor	672	3917	Tenneco Oil Co.
Charlotte Harbor	715	3918	Chevron U.S.A. Inc.
Charlotte Harbor	716	3919	Tenneco Oil Co.
St. Petersburg	753	3905	Gulf Oil Corp.
The Elbow	565	3343	Mobil Oil
The Elbow	566	3344	Mobil Oil
The Elbow	652	3342	Mobil Oil
The Elbow	871	3894	Mobil Oil
The Elbow	915	3341	Mobil Oil

Table I-2

Active Leases
South Central Section of Eastern Planning Area

Lease Area	Block	Lease No.	Lessee
Charlotte Harbor	577	4944	Shell Oil Co.
Charlotte Harbor	578	4945	Shell Oil Co.
Charlotte Harbor	579	4946	Shell Oil Co.
Charlotte Harbor	580	4947	Shell Oil Co.
Charlotte Harbor	581	4948	Shell Oil Co.
Charlotte Harbor	621	4949	Shell Oil Co.
Charlotte Harbor	622	4950	Shell Oil Co.
Charlotte Harbor	623	4951	Shell Oil Co.
Charlotte Harbor	665	4952	Shell Oil Co.
Charlotte Harbor	666	4953	Shell Oil Co.
Charlotte Harbor	667	4954	Shell Oil Co.
Charlotte Harbor	668	4955	Shell Oil Co.
Charlotte Harbor	709	4956	Shell Oil Co.
Charlotte Harbor	710	4957	Shell Oil Co.
Charlotte Harbor	711	4958	Shell Oil Co.
Charlotte Harbor	712	4959	Shell Oil Co.

Lease Area	Block	Lease No.	Lessee
Charlotte Harbor	753	4960	Shell Oil Co.
Charlotte Harbor	754	4961	Shell Oil Co.
Charlotte Harbor	755	4962	Shell Oil Co.
Charlotte Harbor	756	4963	Shell Oil Co.
Charlotte Harbor	796	5249	Texaco Inc.
Charlotte Harbor	797	5098	Shell Offshore Inc.
Charlotte Harbor	798	5099	Shell Offshore Inc.
Charlotte Harbor	840	5250	Texaco Inc.
Charlotte Harbor	841	5100	Shell Offshore Inc.
Charlotte Harbor	842	5101	Shell Offshore Inc.
Charlotte Harbor	843	5102	Shell Offshore Inc.
Charlotte Harbor	886	5103	Shell Offshore Inc.
Charlotte Harbor	887	5104	Shell Offshore Inc.
Charlotte Harbor	931	5105	Shell Offshore Inc.
Charlotte Harbor	932	5106	Shell Offshore Inc.
Charlotte Harbor	975	5107	Shell Offshore Inc.
Howell Hook	528	6543	Texaco Inc.
Howell Hook	773	6544	Texaco Inc.
Howell Hook	774	6545	Texaco Inc.
Pulley Ridge	589	6486	The Superior Oil Co.
Pulley Ridge	590	6487	The Superior Oil Co.
Pulley Ridge	598	6488	The Superior Oil Co.
Pulley Ridge	599	6489	Gulf, et al.
Pulley Ridge	600	6490	The Superior Oil Co.
Pulley Ridge	629	6491	Union, et al.
Pulley Ridge	630	6492	Union, et al.
Pulley Ridge	631	6493	The Superior Oil Co.
Pulley Ridge	632	6494	The Superior Oil Co.
Pulley Ridge	633	6495	The Superior Oil Co.
Pulley Ridge	642	6496	The Superior Oil Co.
Pulley Ridge	643	6497	Gulf, et al.
Pulley Ridge	644	6498	The Superior Oil Co.
Pulley Ridge	671	6499	The Superior Oil Co.
Pulley Ridge	672	6500	Gulf, et al.
Pulley Ridge	673	6501	The Superior Oil Co.
Pulley Ridge	674	6502	The Superior Oil Co.
Pulley Ridge	675	6503	The Superior Oil Co.
Pulley Ridge	687	6504	The Superior Oil Co.
Pulley Ridge	688	6505	The Superior Oil Co.
Pulley Ridge	694	6506	Tenneco, et al.
Pulley Ridge	695	6507	Tenneco, et al.
Pulley Ridge	714	6508	Gulf, et al.
Pulley Ridge	715	6509	The Superior Oil Co.
Pulley Ridge	716	6510	Union, et al.
Pulley Ridge	717	6511	The Superior Oil Co.
Pulley Ridge	718	6512	The Superior Oil Co.
Pulley Ridge	719	6513	The Superior Oil Co.
Pulley Ridge	738	6514	Shell Offshore Inc.
Pulley Ridge	739	6515	Shell Offshore Inc.
Pulley Ridge	757	6516	Gulf, et al.
Pulley Ridge	758	6517	Gulf, et al.

Lease Area	Block	Lease No.	Lessee
Pulley Ridge	760	6518	Union Oil Co. of Calif.
Pulley Ridge	761	6519	Union Oil Co. of Calif.
Pulley Ridge	799	6520	Gulf, et al.
Pulley Ridge	800	6521	Gulf, et al.
Pulley Ridge	830	6522	Shell Offshore Inc.
Pulley Ridge	831	6523	Shell Offshore Inc.
Pulley Ridge	846	6524	Gulf, et al.
Pulley Ridge	847	6525	Gulf, et al.
Pulley Ridge	874	6526	Shell Offshore Inc.
Pulley Ridge	875	6527	Shell Offshore Inc.
Pulley Ridge	890	6528	Gulf, et al.
Pulley Ridge	891	6529	Gulf, et al.
Pulley Ridge	930	6530	Superior, et al.
Pulley Ridge	931	6531	Superior, et al.
Pulley Ridge	963	6532	Shell Offshore Inc.
Pulley Ridge	964	6533	Shell Offshore Inc.
Pulley Ridge	974	6534	Superior, et al.
Pulley Ridge	975	6535	Superior, et al.
Pulley Ridge	994	6536	Superior, et al.
Pulley Ridge	995	6537	Superior, et al.
Pulley Ridge	999	6538	Tenneco, et al.
Pulley Ridge	1000	6539	Shell Offshore Inc.
Pulley Ridge	1001	6540	Tenneco, et al.
Pulley Ridge	1007	6541	Shell Offshore Inc.
Pulley Ridge	1008	6542	Shell Offshore Inc.
Pulley Ridge	65	8369	Cities Service; Amoco
Pulley Ridge	109	8371	Cities Service; Amoco
Pulley Ridge	953	8376	Cities Service; Amoco
Pulley Ridge	954	8377	Cities Service; Amoco
Pulley Ridge	108	8370	Cities Service; Amoco
Pulley Ridge	828	8372	Cities Service; Amoco
Pulley Ridge	829	8373	Cities Service; Amoco
Pulley Ridge	872	8374	Cities Service; Amoco
Pulley Ridge	873	8375	Shell; Conoco
Pulley Ridge	955	8378	Shell; Conoco
Pulley Ridge	956	8379	Shell; Conoco
Pulley Ridge	957	8380	Shell; Conoco
Pulley Ridge	998	8381	Shell; Conoco

Table I-3

Environmental Assessments Prepared for Exploration South Central Section of Eastern Planning Area

Area	Block(s)	Lease No.	EA No.	Wells Drilled
Charlotte Harbor	144, 145	3906, 3907	478	1 each block
Charlotte Harbor	188, 231	3909, 3911	497	1 - Block 188
Charlotte Harbor	265	3912	491	1
Charlotte Harbor	628	3915	492	1
Charlotte Harbor	672, 716	3917, 3919	254	1 - Block 672
Charlotte Harbor	715	3918	499	None
St. Petersburg	753	3905	502	None
The Elbow	652	3342	496	None
The Elbow	565, 566	3343, 3344	495	1 - Block 566
Vernon	610	3900	498	1
Vernon	654	3903	493	1

Source: USDI, GS, 1980a-f; 1981a-e; and 1982.

II. ALTERNATIVES TO PROPOSED ACTION

This section will be addressed in an SEA.

III. DESCRIPTION OF AFFECTED ENVIRONMENT

A. PHYSICAL ENVIRONMENT

1. Environmental Geology and Hazards

a. General Description of Geology and Structure

The continental margin of the eastern Gulf of Mexico is dominated by the Florida platform which is composed of a thick accumulation of neritic to bathyal carbonate and evaporate deposits of Mesozoic and Cenozoic age. The platform is fronted by a prominent escarpment built by shelf-edge reef complexes during the early Cretaceous. The northern half of the platform was built on a continental foundation composed of upper Precambrian and lower Paleozoic igneous and metamorphic rocks and capped by undeformed clastic sediments of Ordovician, Silurian, and Devonian ages. Southern peninsular Florida is underlain by basement composed of volcanic and hypabyssal rocks of Triassic and early Jurassic age. Geophysical data suggest similar basement complexes beneath the west Florida shelf and slope (Martin, 1978).

The west Florida platform is characterized by nearly horizontal carbonate strata, with a thin covering of Pleistocene and Holocene sediments. The area has several regional scale structural features, including the Apalachicola Embayment, the Ocala Uplift, and the South Florida Basin (Visual No. 2; USDI, MMS, 1984b). Within these large regional structures there are several well known small features, such as the Florida Middle Ground, the Tampa Arch, and the Southwest Florida Reef Trend, and there are many of the lesser known arches, anticlines, and basins. At the edge of the West Florida Platform there are numerous shelf edge filled embayments and several basin structures behind the shelf edge reef complexes (USDI, MMS, 1984a).

The dominant structural feature in the AEA area is the elongate South Florida Basin, which extends in an east-west direction across southern peninsular Florida and the South Florida Shelf (Figures III-1 and III-2). The basin contains a sequence of Mesozoic-Cenozoic carbonate deposits over 4.6 km (2.9 mi) thick (Martin, 1978). The geology and oil potential of the South Florida Basin has been described by Winston (1971).

b. Bathymetry and Bottom Sediments

Water depth ranges from approximately 2m (7 ft) in Block 551 of the Tarpon Springs Area to 1,050m (3,455 ft) in Block 317 of The Elbow Area.

The major relief feature on the shelf area of the AEA is the Central Shelf Hardground Trend (Figure III-1). It is a large skeletal buildup landward of the shelf break on the peninsular shelf.

Most of the sediment of the Mississippi River is delivered directly to the shelf edge or is transported to the west. As a result, the Mississippi, Alabama, Florida (MAFLA) continental margin is covered by a sand sheet which is predominantly quartz west of Cape San Blas and carbonate southeast of Cape San Blas.

Rivers which empty into the eastern Gulf region carry little sediment and virtually none of this is sand sized. Most of the fine sediments delivered to the coast are trapped in estuaries, bays, and lagoons.

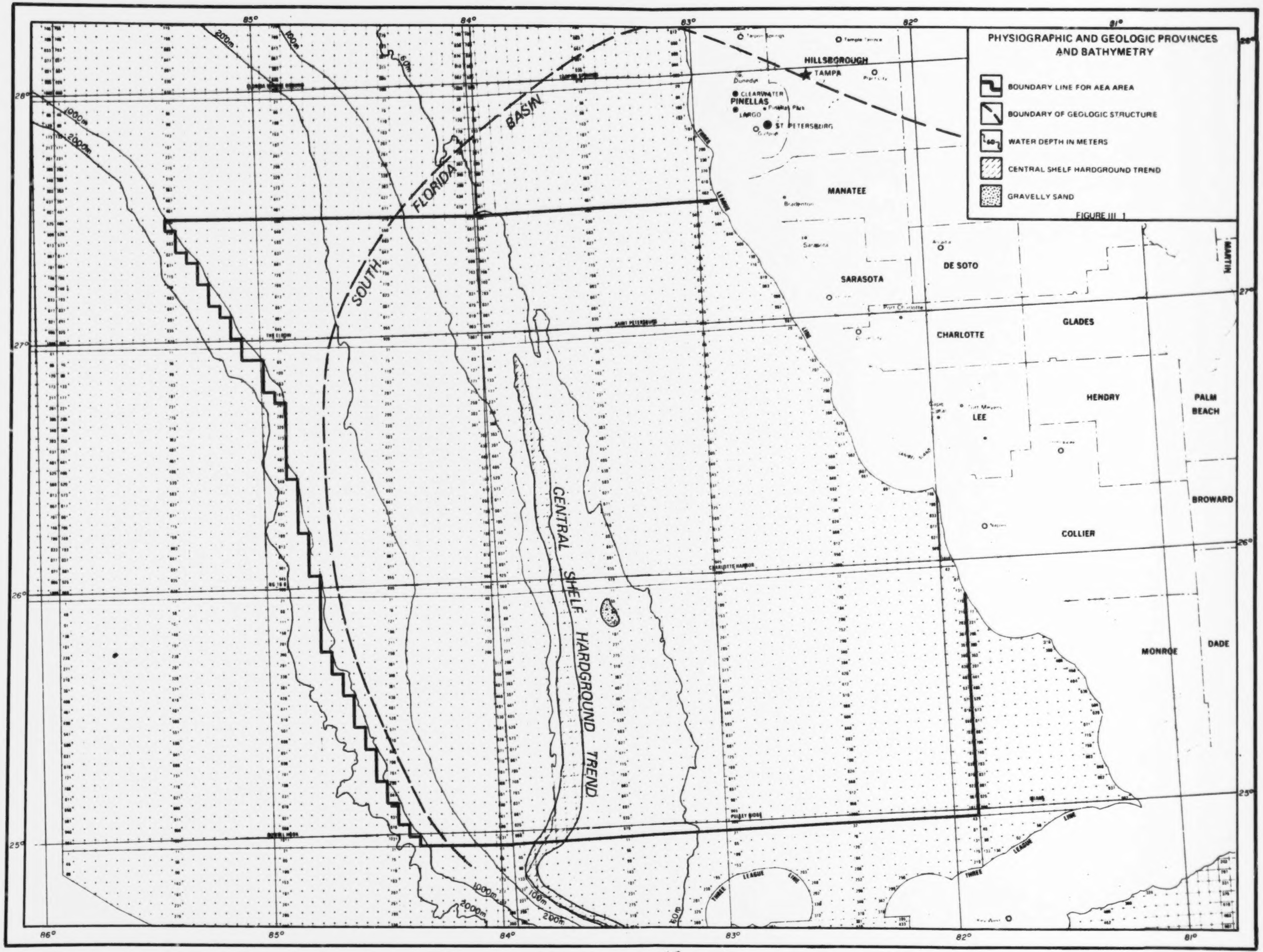


FIGURE III 1

PHYSIOGRAPHIC AND GEOLOGIC PROVINCES AND BATHYMETRY

BOUNDARY LINE FOR AEA AREA
BOUNDARY OF GEOLOGIC STRUCTURE
WATER DEPTH IN METERS
60
CENTRAL SHELF HARDGROUND TREND
GRAVELLY SAND
SOUTH FLORIDA BASIN
CENTRAL SHELF HARDGROUND TREND
HILLSBOROUGH
TAMPA
PINELLAS
CLEARWATER
LARGO
ST PETERSBURG
Dunedin
MANATEE
Bradenton
Sarasota
SARASOTA
DE SOTO
Port Charlotte
CHARLOTTE
GLADES
MARTIN
HENDRY
PALM BEACH
LEE
Fort Myers
COLLIER
BROWARD
MONROE
DADE
THREE LEAGUE LINE
THREE LEAGUE LINE
THREE LEAGUE LINE
THE ELBOW
SAINT PETERSBURG
CHARLOTTE HARBOR
PULLEY RIDGE
DRY TORTUGAS
1000m
2000m
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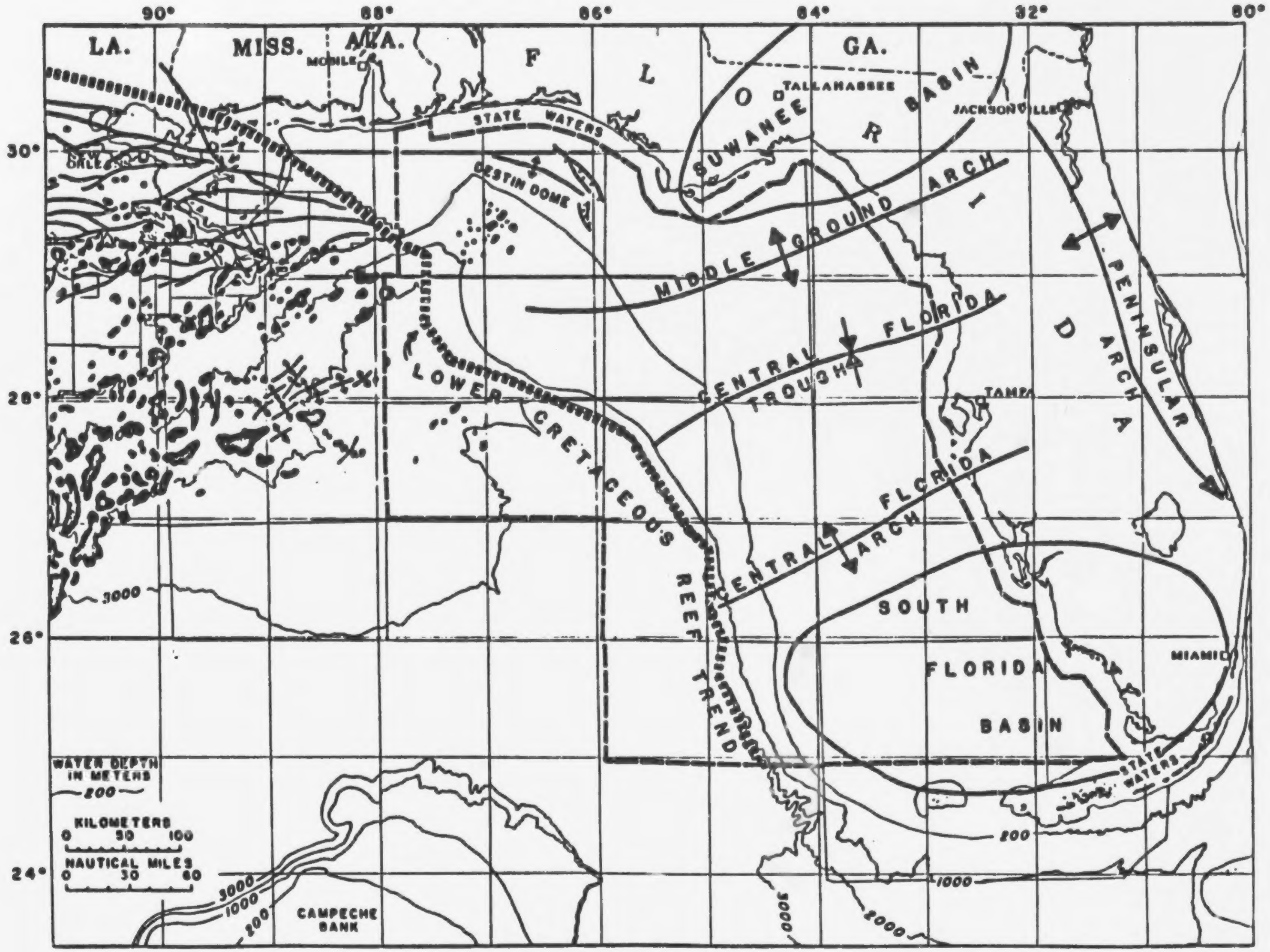
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LA.
MISS.
ALA.
GA.
F L O R I D A
MOBILE
TALLAHASSEE
JACKSONVILLE
NEW ORLEANS
TAMPA
MIAMI
STATE WATERS
SUWANEE BASIN
DESTIN DOME
MIDDLE GROUND ARCH
PENINSULAR ARCH
CENTRAL FLORIDA TROUGH
CENTRAL FLORIDA ARCH
LOWER CRETACEOUS REEF TREND
SOUTH FLORIDA BASIN
CAMPECHE BANK
3000
1000
200
2000
WATER DEPTH IN METERS
KILOMETERS
0 50 100
NAUTICAL MILES
0 30 60

Figure III-2 Map showing major structural features of the Eastern Gulf of Mexico OCS and adjacent areas from Shideler (1983).

c. Potential Geologic and Man-Made Hazards

Seismic - In the eastern Gulf of Mexico, seismic risk is negligible (Algermissen and Perkins, 1976). This appears to be a rather unique area as the geological and historical record indicates it is one of the most seismically stable areas in the world. Two earthquakes of notable intensity that occurred in the Gulf of Mexico near this area had epicenters located north of Vera Cruz, Mexico; one in over 600m (1,969 ft) of water near 93°W and 27°30'N. Neither of these earthquakes produced damaging tsunamis, and neither were considered well located events.

Bottom Conditions - Potential hazardous bottom conditions present on the west Florida Platform in the area of this AEA include karst topography (Figure III-3).

Karst features are widespread but noncontiguous in distribution on the West Florida Platform from the Florida Middle Ground to the Florida Keys. Surface expression of the karst is evidenced in some areas; while in other locales, subsurface karst is inferred from the seismic anomalies. Total depth of the carbonate strata is approximately 4,573m (15,000 ft) on the West Florida Platform; however, the depth of possible karst development is undefined without appropriate data on sea level/water table variations as they may have affected the carbonate platform. The predominant karst is found in porous Eocene limestone strata that is over 600m (1,969 ft) thick beginning below the seafloor surface. The karst consists of concentrations of dolines (sinkholes) formed by either solution of surface limestone or by collapse of underlying solution caverns, and in some areas a rough barren topography of deep furrows or channels which reflect surface solution along joint patterns (USDI, MMS, 1983a). Other potential geologic hazards identified in the Southwest Florida Ecosystems Study (Woodward-Clyde Consultants and Continental Shelf Associates, 1983b) include bedrock outcrops, pinnacles, irregular topography, depressions, buried channels, and shallow faulting. Hydrogen sulfide gas is a hazard that may be encountered during drilling operations in any area of the OCS.

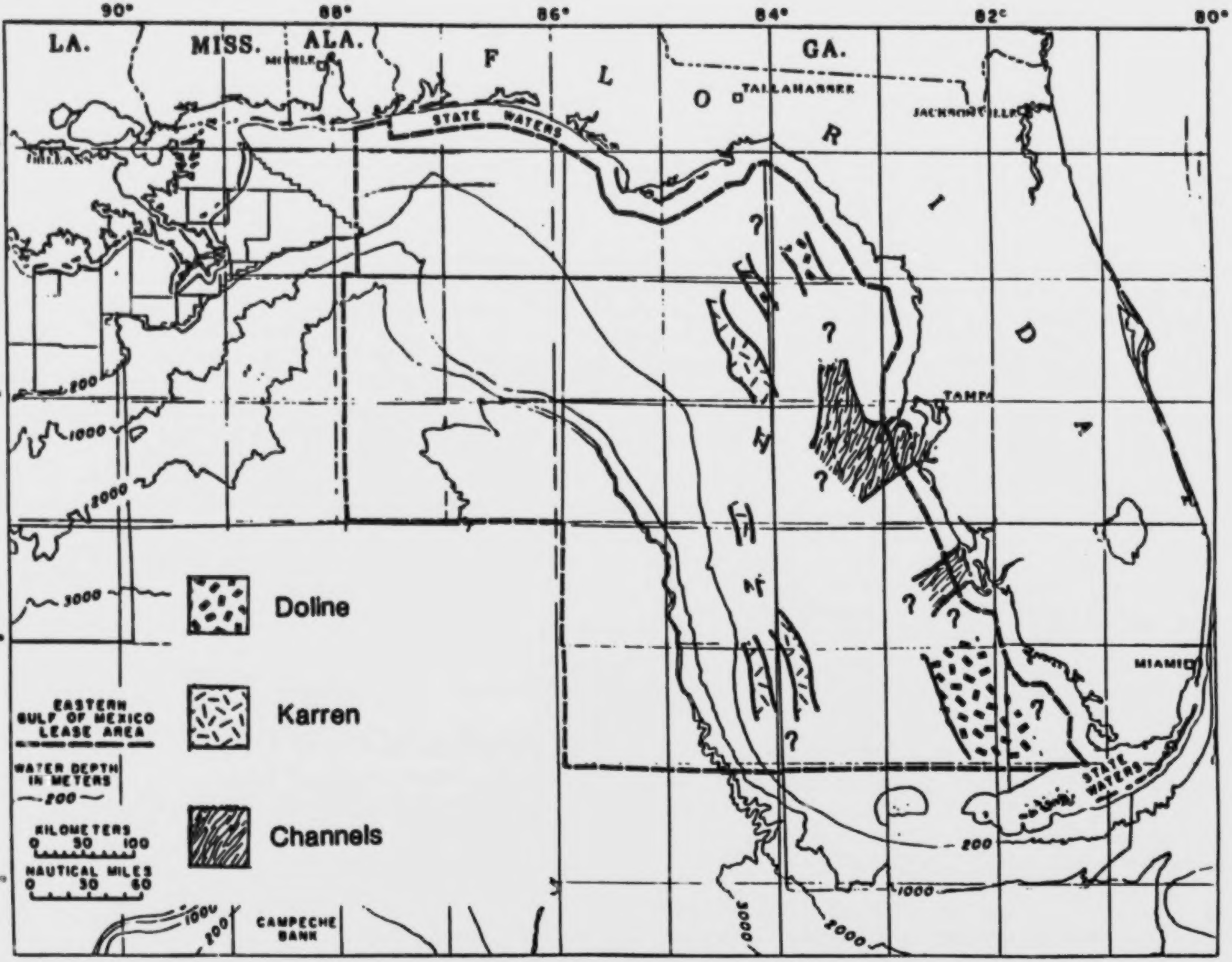
Geopressures - Rapid depositions upon clays can yield abnormal pressures because confined water is slow to leak and would initially assume the load. Abnormal pressure of this type is not likely to be found in the AEA area as the volume and composition of sediments delivered into the eastern Gulf region are not the same as those that are delivered by the Mississippi River to the shelf edge.

Specific geologic and man-made hazards located within the area of exploration activities would be addressed in an SEA. Refer to Section IV.B.1.a for additional information on man-made hazards.

d. Petroleum Geology

The northern Gulf of Mexico can be divided into two major geologic regions based on the bedrock, structure, and rates of sedimentation: Region 1 from the DeSoto Canyon in the east to the U.S./Mexico boundary on the west, and Region 2 from the DeSoto Canyon on the north to the Florida Keys on the south.

Region 2 which includes the West Florida Platform, is characterized by nearly horizontal carbonate strata, with a thin covering of Pleistocene and Holocene sediments. The South Florida Basin, which is the dominant hydrocarbon


90°
88°
86°
84°
82°
80°
30°
28°
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LA.
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F
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I
D
A
TALLAHASSEE
JACKSONVILLE
STATE WATERS
TAMPA
MIAMI
200
1000
2000
3000
Doline
Karren
Channels
EASTERN GULF OF MEXICO LEASE AREA
WATER DEPTH IN METERS
200
KILOMETERS
0 50 100
NAUTICAL MILES
0 30 60
CAMPECHE BANK
?

Figure III-3 Distribution of known areas of karst features and channels taken from Holmes and Doyle (1983).

production province of peninsular Florida (Shideler, 1983), almost wholly underlies the area of this AEA. For more detailed information concerning petroleum geology in the eastern Gulf of Mexico, see Volume 1, Section III.A.1 of USDI, MMS, 1983a.

2. Meteorological Conditions

The east central Gulf of Mexico is influenced by a maritime subtropical climate controlled mainly by the clockwise wind circulation around a semi-permanent area of high barometric pressure alternating between the Azores and Bermuda Islands. This circulation, around the western edge of the high pressure cell, aided by the trade winds, results in the predominance of moist easterly wind flow over this area. Another factor influencing the climate in the east central Gulf is the persistence of high barometric pressure over the North American continent during the winter months, resulting in rare periods of relatively dry northerly wind flow (USDC, NOAA, 1972).

a. Temperature

Air temperatures over the east central Gulf are typical of a maritime climate and show little diurnal or seasonal variation. Average summer temperature is 29°C (84°F). Winter temperature averages 21°C (70°F). High temperature extremes occur mainly in August, the warmest month, but rarely exceed 30°C (86°F) because of the moderating influence of the Gulf water temperature. Winter minimum temperatures rarely fall below 0°C (32°F), but may if an arctic air mass penetrates far enough southeastward into the Gulf (USDC, NOAA, 1972).

b. Cloudiness and Visibility

On a yearly average, five to six tenths of the sky is obscured by cloud cover and there is relatively little seasonal variation. October is usually the most cloud free month and December through March the cloudiest. The clouds in the winter season are mostly widespread stratus type clouds while the summer clouds are cumulus type. Restrictions to visibility affecting navigation occur mainly during winter in the form of advection fog near the coastline. Most fog forms during the early morning and usually lasts four to five hours. Particularly dense seafog may persist for several days (USDC, NOAA, 1972). Visibility is reduced to less than ¼ mile (heavy fog) in the eastern Gulf from 35 days/year in Pensacola to 1 day/year at Key West (USDI, MMS, 1983a).

c. Wind

During the spring and summer months winds are mainly easterly around 16km/hr (10 mph), but in the fall and winter months winds are mainly northeast 25km/hr (16 mph). Occasionally winds are calm, averaging about eight percent of the time, but can reach as high as 324km/hr (200 mph) during hurricanes or 200km/hr (124 mph) in intense winter storms. Normal wind speeds and directions could be expected to fall within the following ranges given in Table III-1.

Table III-1

Normal Wind Speed, Frequency, and Direction

Wind Direction	Percent Frequency	Mean Speed km/hr
N	15.3	12.6
NE	16.9	14.5
E	18.4	13.3
SE	12.2	11.7
S	9.5	11.6
SW	4.3	12.5
W	6.8	8.7
NW	8.2	9.4
Calm	8.4	----

Source: USDOD, DMA, 1975.

d. Precipitation

Average annual precipitation along the western Florida Gulf coast varies from 102cm (40 in) in Key West to 137cm (54 in) in Fort Myers to 124cm (48 in) in Tampa. Rainfall is fairly evenly distributed throughout the year with the greatest amounts occuring during the summer showers (USDC, NOAA, 1972).

e. Severe Weather

Severe storms do occur in the Gulf. The most destructive are hurricanes which occur principally during the late summer and early fall. Effects from a hurricane should be expected at least once each four years. Tropical depressions are common during the summer and fall but few develop into hurricanes. Severe winter storms move generally from west to east and can be expected to affect this area twice each year (USDI, BLM, 1980, Visual No. 6).

3. Physical Oceanography

a. Sea Temperature and Salinity

Generally, the oceanographic conditions in the east central Gulf environmental assessment area are relatively stable. Extreme conditions are infrequent; however, they can and do occur throughout the year. Because of its location and wide range of bathymetry, 2-1,050m (7-3,455 ft), it is necessary to consider influencing factors from the open Gulf [greater than 200m (656 ft)] and the inshore Gulf [less than 200m (656 ft)] when describing conditions in the analysis area.

Water temperatures vary widely [5-29°C (41-84°F)] with depth. Seasonally, surface temperatures vary about 16°C from 15-31°C (49-88°F) from late summer to early spring. However, below 150m (492 ft) depth, average seasonal water temperatures at specific locations throughout the water column show very little change. The average temperature at 1,000m (3,281 ft) depth is about 5°C (41°F) (Molinari and Mayer, 1980).

Representative XBT traces taken very near the analysis area (28°N 85.5°W) show that the depth of the permanent thermocline (where large density gradients occur) is associated with the 12°C (53.6°F) isotherm (Molinari and Mayer, 1980). The depth of the permanent thermocline varies between 258m (846 ft) during summer and 347m (1,139 ft) during late spring and fall.

In the shallow portion of the water column less than 150m (492 ft), a shallow seasonal thermocline develops during summer and the presence of temperature inversions could develop during winter. The true shallow mixed layer (where no temperature change exists) is nearly nonexistent. The typical surface mixed layer defined for site specific Ocean Thermal Energy Conversion studies near the analysis area (where T = 0.2°C) ranges from 5-60m (16-197 ft) (Molinari and Mayer, 1980). Additionally, sea surface temperatures are nearly isothermal in the late spring through summer.

High frequency water temperature deviations occur throughout the water column in the analysis area whenever a major oceanographic event occurs and moves through the area. The northern extension of the Loop Current, Loop Current eddy shedding, severe storm activity, and extensive river runoff have been known to cause drastic changes in the thermal structure and may implicate the existence of moderate to high velocity currents. Thermal contrast has been used as an identifier and tracker for these events.

It is well known that the Loop Current penetrates far into the northern extent of the eastern Gulf. It also influences this same area indirectly as eddies from the Loop Current shed and take shape in this area prior to moving towards the western Gulf or apparently reestablishing (structurally) with the Loop Current. The northern most extent of Loop Current water has been identified and studied thermally.

Major and minor Loop Current intrusions into the analysis area have been found on occasion. Each particular intrusion is distinctive as to the amount of area affected. However, studies show that the eastern-most extent of penetration into the study area is between 83° and 84°W longitude, well shoreward of the shelf break [200m (656 ft)] and approximately centered around 87°W longitude. Often, nearly 100% of the study area seaward of the shelf break was affected by the intrusion. Although it is not possible to pinpoint the overall frequency and period of Loop Current intrusions into the analysis area, a frequency analysis (%) by month (when available) of the location of Loop Current water shows two months (March and April) where the 25% frequency line extends across the analysis area near 84°W longitude and that it coincides with the western-most boundary of the analysis area (27.5N, 85.5W) for two additional months (January and February) (Vukovich, et al., 1979). Data showing summer intrusions is not currently available.

Severe storm activity in or near the analysis area can also have a major influence on the water column. Extensive mixing in the upper layers takes place due to wind/wave activities. The water column would vary considerably depending on the depth and topography of the particular site considered; that is full scale mixing would occur in shallow areas, possible upwelling would occur near topographic breaks, and a varied response would occur throughout the water column in deeper areas, including the possible development of internal waves.

Another event, a cold water intrusion moving into the analysis area resulting from high volume river/bay runoff, could also impose significant influence. Cold water intrusions in the analysis area are mostly of minor extent (size) due to the lack of any major rivers draining into this area.

Table III-2

Water Property Extremes in the Gulf of Mexico

Water Mass	Extreme	Concentrations	Depth Range (m)	Location
Gulf Water	Salinity maximum	36.4-36.5 ppt	0-250	Gulf-wide
Subtropical (SUW)	Salinity maximum	less than 36.8 ppt	200-300	Eastern Gulf* Underwater
18° Sargassso (18° SSW)	Oxygen maximum	(small and variable)	200-400	Eastern Gulf* Seawater
Tropical Atlantic	Oxygen minimum	2.5-2.9 ml/l	250-400	Gulf-wide Central Water
Antarctic	Nitrate maximum	29-35 ug-at/l	500-700	Gulf-wide Intermediate Water
Antarctic	Phosphate maximum	1.7-2.5 ug-at/l	600-800	Gulf-wide Intermediate Water
Antarctic	Salinity maximum	34.88-34.89 ppt	700-800	Gulf-wide Intermediate Water
Mixture of North Water	Silicate maximum and Carribbean Mid-Water	24-28 ug-at/l	1,000-1,100	Gulf-wide Atlantic Deep

* SUW may occasionally be found in the Western Gulf in eddies detached from the Loop Current. There have also been indications of 18°SSW in detached eddies, but the evidence is slight.

Source: USDI, MMS, 1984b.

Occasionally, a cold intrusion of large extent occurs in the analysis area. A temperature difference of 3-5°C is found to exist between these cold intrusions and the surrounding surface waters.

Salinities in the mixed layer extending to a depth of approximately 100-150m (328-492 ft) are characteristically between 36°/oo and 36.5°/oo in the open Gulf. Salinity valves in shelf regions may vary widely from this range due to the opposing effects of river input and enhanced evaporation. Rarely alternating floods and droughts may cause salinity changes from nearly fresh to 100°/oo, three times that of normal sea water (USDI, MMS, 1984b).

For a summary of water mass divisions, see Table III-2.

b. Currents

Currents in the analysis area are forced by many different activities. Tides, winds, freshwater runoff, and deep water influences combine to make up shelf circulation; whereas, the Loop Current, Loop Current eddies, and severe storms offer the major influence over deep ocean [greater than 200m (656 ft)] areas.

Current studies on the shelf near the analysis area indicate that a predominantly wind-driven regime exists. A two-layered flow system was observed and exists at unknown periods. At times the upper and lower layers flow in approximately opposite directions (a shear condition exists) with moderate-to-high relative velocity. Net motion is possible in either alongshore direction. A persistent cyclonic pattern with speeds generally from 10-50cm/sec (0.2-1 kns) occur throughout the year (USDOD, 1977).

Although no known studies exist showing the magnitude and duration of Loop Current influence and forcing along the shelf break and on the shelf in the analysis area, data products do exist that give us some idea what to expect on the shelf and at the shelf break from this phenomenon "Loop Current intrusion." Analyses using satellite thermal imagery (Vukovich, et al., 1979) show that Loop Current intrusion onto the shelf beyond the shelf break does occur. The periodicity, duration, and strength of these intrusions is unknown; however, data products do exist that give us some idea. Often a significant portion of the analysis area is affected. As stated, the magnitude of the resulting "shelf current" is unknown. This is assumed to be high velocity water movement in excess of 30cm/sec (0.6 kns) with a maximum velocity approaching 60cm/sec (1.2 kns) (Ebbesmeyer, et al., 1982). In areas where this activity penetrates shoreward of the shelf break, it can be assumed that nearly the entire water column would react as mentioned. In areas seaward of the shelf break, high velocity water can be expected from the surface to approximately 500m (1,641 ft) depth and velocities would range form 0.5m/sec (1 kns) to near 2.0m/sec (3.5 kns) when Loop Current intrusion occurs. Current direction is somewhat parallel to bathymetry.

It is unknown what effect cold water intrusions, as previously discussed, would have on water velocities in the study area. Severe storm activity in or near the area may also cause high velocity water movement. Studies at the Flower Garden Banks indicate that a tropical storm [20m/sec (39 kns) winds] caused a response at bottom [60m (197 ft) depth] that yielded maximum current velocities near 60 cm/sec (1.2 kns) at times. Although the velocity is thought to have been amplified to this level by means other than a direct frictional response, it does give some relation to the possibilities (Rezak, et al., 1983).

c. Tides and Sea State

Tides in the analysis area are generally semidiurnal and very small in range, with a maximum of about 1m (approximately 3 ft). Their influence on circulation in the area is mostly in and around bays, inlets, and the nearby coastline. The major tide variations are keyed to the declination of the moon. "Tidal currents" in the Gulf are generally very small except around inlets and barrier islands where maximum velocities may approach 100-150cm/sec (2-3 kns). On the shelf, the tidal component of the flow is relatively weak. For additional information, refer to the final REIS (USDI, MMS, 1983a).

Storm activity in the area may result in storm surge above 6m (20 ft) above normal water levels and large waves 9-13m (30-43 ft) (USDI, BLM, 1980; Visual No. 6). The proximity, duration, strength, etc. of a storm determine the resultant surge and wave activity. Tables III-3 and III-4 show the recurrence of storm activity and the annual frequency of various size classes of waves nearby the analysis area.

Table III-3

Number of Occurrences of Hurricanes Observed in the Region 25° to 30°N, 87.5°W, to the West Coast of Florida, From 1886 Through 1977

Time Period	Number of Occurrences	Time Period	Number of Occurrences
1-10 June	8	1-10 September	12
11-20 June	10	11-20 September	16
21-30 June	5	21-30 September	10
1-10 July	3	1-10 October	14
11-20 July	3	11-20 October	10
21-31 July	6	20-31 October	5
1-10 August	7	1-10 November	0
11-20 August	5	11-20 November	0
21-31 August	8	21-30 November	1

Source: Molinari and Mayer, 1980.

Table III-4

Wave Height

Wave Height	Annual Percent Frequency
1-2 ft (0.3-0.6m)	27.1
3-9 ft (0.9-2.7m)	56.4
10-19 ft (3.0-5.8m)	2.2
20-+ ft (6.1-+m)	0.1

Source: USDI, MMS, 1983a, Visual No. 6.

4. Water Quality

Water quality is based upon numerous factors including currents; freshwater inputs; nature and number of discharges; outfalls; and human activities that consist of municipal and industrial waste discharges, runoff, oil spillage, dredging, etc. In the past, water quality has been defined as the degree to which chemical concentrations and physical parameters within a water mass approach the ambient water state. Offshore water quality degradation in the Gulf of Mexico is associated primarily with effluent discharges by current offshore enterprises, consisting of OCS activities and marine transportation sources (USDI, MMS, 1984b).

Estuaries are characterized by a high dissolved oxygen (DO) concentration, low to medium coliform values, and medium chlorophyll concentrations. According to data collected by the U.S. Fish and Wildlife Service National Coastal Ecosystems Team (FWS/NCET) for the Florida Coastal Characterization Studies, water in the southeast portion of the eastern planning area exhibits good-to-average quality overall, with Hillsborough Bay and the Peace River tidal influence exhibiting the worst water quality in the area. Water in the Charlotte Harbor and Florida Bay areas exhibit a better-than-average quality. The most serious water quality problem existing on the west coast of Florida occurs in the Tampa Bay area which is characterized as a large, shallow estuarine system with restricted tidal flushing. Land use in the area adjacent to the bay is primarily urban with major sources of pollution resulting from domestic sewage, industrial effluents, and urban stormwater runoff from the metropolitan Tampa, St. Petersburg, Clearwater, and Bradenton areas (USDI, MMS, 1983a).

The most serious environmental constraint to urban growth and economic development facing southwest Florida deals with the availability and distribution of potable and nonpotable water sources. Historically, this region was rich in surface and groundwater resources that were adequate for domestic industrial and agricultural uses. Rapid growth rates in urban population along the coastal counties in the eastern Gulf have caused severe shortages of potable drinking water and considerable competition for existing water sources. The simultaneous lowering of aquifer and water table levels is due to drainage improvements and the construction of hundreds of miles of canals for the draining of interior wetlands for the expansion of agriculture and industrial phosphate mining activities. These cumulative activities have resulted in a falling water table and saltwater intrusion in many coastal areas of this region (USDI, MMS, 1983a).

5. Air Quality

The coastal counties in Florida adjacent to this environmental assessment area include Manatee in the U.S. Environmental Protection Agency (USEPA) Air Quality Control Region (AQCR) 52; and Sarasota, Charlotte, Lee, and Collier in USEPA AQCR 51. The entire area is a Class II attainment area. A Class II attainment area allows residential, commercial, or industrial development as long as prevention of significant deterioration of air quality is complied with. The entire area either cannot be classified or is better than the National Standard for all criteria pollutants (40 CFR 81.3 and 40 CFR 81.4).

The air quality of the offshore area is considered good. One shipping lane traverses an area north of the AEA area (Figure III-6). The only other human activities include fishing, pleasure boating, and military uses. Many of the pollutants found onshore are not prevalent offshore.

B. BIOLOGICAL ENVIRONMENT

1. Coastal Habitats

Coral reefs - Coastal waters adjacent to the AEA area support an arc-shaped band of coral formations known as the Florida Reef Tract. This formation is bordered by the Straits of Florida on the seaward side and the Florida Keys on the shoreward side. It stretches for approximately 241km (150 mi) in length and has an average width of 6km (4 mi) (Palik and Lewis, 1983).

The Florida Reef Tract is considered to be a northern extension of the reef tract which spans the western Atlantic. It supports an estimated 50 coral species which are commonly found in the Bahamian and West Indian coral regions. The coral reef is a framework of living and dead coral and coral-like algae, which exist in areas of warm water and adequate sunlight penetration. Coral reef communities support more plant and animal species than any other marine ecosystem. Most reef-building corals share a symbiotic relationship with microscopic unicellular algae, which live in the tissues of the coral polyps. This animal/plant symbiosis forms the basis of the biological productivity of the ecosystem and for the secretion of calcium carbonate, which forms the hard skeleton of the corals. Light controls the amount of photosynthesis of the algae symbionts, which in turn control the rate of calcium carbonate deposition by the coral. This fact makes light the most important element in the growth and distribution of these corals (Palik and Lewis, 1983).

Two reef types, bank reefs and patch reefs, can be found in the Florida Reef Tract. Bank reefs occur near the shallow continental shelf break in relatively high energy environments. Typically elongated, these reefs form a narrow discontinuous belt which spans the entire length of the Keys. Outer portions of bank reefs are typically dominated by elkhorn coral *(Acropora palmata)*, a principal builder of the bank reef. In less turbulent areas, staghorn coral *(Acropora cervicornis)* and club-finger corals *(Porites porites)* can be found. Head corals, such as star coral *(Montastrea annularis)*, tend to be found in shallow, sheltered parts of bank reefs and in deeper areas in front of the reef slope. Behind the bank reefs, numerous patch reefs are found. They are typically circular or eliptical in shape and corals found here may include star corals *(Montastrea annularis)* and fire corals *(Millepora alcicornis)* (Beccasio, et al., 1982).

Both types of reefs support algae, sponges, and numerous invertebrates including the spiny lobster and stone crab. In addition, the reef habitat of the Florida Keys supports more than 500 species of fish, many which are of commercial and recreational importance (Beccasio, et al., 1982). Also, the Florida Reef Tract directly supports the economically valuable recreational industry of skin and scuba diving (Palik and Lewis, 1983).

Wetlands - Four wetland habitats characterize the coastal environment adjacent to the AEA area. These are seagrass beds, nonforested wetlands (marshes), forested wetlands, and mangroves. Table III-5 gives the acreage of the various coastal wetland habitats by county in the assessment impact area. Refer to Visual 6 of the Final Environmental Impact Statement (FEIS) for Sales 81 and 84 for the locations of the wetland types which will be discussed (USDI, MMS, 1983b).

Table III-5

Coastal Habitats of the Assessment Area by Acre

County	Forested Wetlands	Nonforested Wetlands	Seagrass		Mangroves
			Open	Enclosed	
Pinellas	12,278	2,135	93,699	-	1,728
Hillsborough	64,535	5,832	42,519	-	4,723
Manatee	31,666	11,100	13,144	12,646	4,006
Sarasota	17,909	10,181	-	-	831
Charlotte	23,820	43,956	-	12,215	16,883
Lee	65,777	22,625	-	41,412	34,271
Collier	438,038	154,806	-	-	81,663
Monroe	179,305	188,245	1,235,966	12,260	221,964
TOTALS	833,328	438,880	1,385,328	78,533	366,069

Sources: USDI, MMS, 1983a and c; 1984b.

Coastal wetlands have several important functions. They contribute to the detrital input of surrounding waters, serve as nursery and refuge for various finfish and shellfish, aid in erosion control and substrate building, and provide habitat for a variety of fish and wildlife species. Further explanation of the functions of coastal wetlands can be found in Section B.1. of the *Regional Environmental Assessment For Pipeline Activities* (USDI, MMS, 1983c).

The seagrass beds in the assessment area are dominated by three species: shoal grass *(Halodule wrightii)*, turtle grass *(Thalassia testudinum)*, and manatee grass *(Syringodium filiforme)*. Widgeon grass *(Ruppia maritima)* is a fresh water species that extends into the upper bays of the coast. It is not considered a true seagrass. Shoal grass occupies the shallow water zones and extends into the intertidal areas. It is the most tolerant of varying conditions and tolerates lower salinities and longer periods of exposure to the air than the other seagrasses. Therefore, it occupies the most extensive range. Shoal grass is the pioneer plant species in areas which have been denuded, thereby stabilizing the area for the colonization by turtle grass. Turtle grass is the most abundant species in terms of biomass. It will out-compete shoal grass in areas where the conditions are suitable. Turtle grass requires continually submerged areas for survival and can grow to relatively deep depths. Manatee grass is most often seen growing with turtle grass and occupies the same habitat as turtle grass. Fine carpets of Halophila spp. occur deeper than the occurrence of the major seagrass species (Zieman, 1982).

In coastal waters adjacent to the AEA area, the greatest concentration of seagrasses can be found in a triangle which is bounded by Cape Sable, north Biscayne Bay, and the Dry Tortugas. This area includes the warm, shallow waters of Florida Bay and the Florida Reef Tract. Seagrass coverage drops off rapidly north of Cape Sable, however, where it is virtually eliminated by drainage from the Everglades with its increased turbidity and reduced salinity. From Cape Sable northward, seagrasses are found only in relatively small beds within bays and estuaries or behind barrier islands until north of Tarpon Springs. Several bays on the Gulf coast, including Tampa Bay and Boca Ciega Bay formerly possessed extensive seagrass resources, but dredge and fill operations and other human perturbations have greatly reduced the extent of these beds (Zieman, 1982).

Marshes represent an important habitat type in coastal waters adjacent to the AEA area. The three marsh types, salt, brackish, and fresh, can all be found in this area. Salt and brackish marshes are commonly found in northern coastal areas of the Florida Gulf coast, but in southwest Florida, salt and brackish marshes dominated by such plant species as smooth cordgrass (*Spartina alterniflora*) and salt meadow cordgrass (*S. patens*) are much less prevalent. The reason for this is that within the subtropical climate of the area, mangroves are rarely killed back by periodic freezes and can outcompete the shorter marsh grass species over most of the range. The exceptions to this appear to be in brackish to freshwater streams connected to marine waters, where marshes dominated by needlerush (*Juncus roemerianus*), can form large monotypic stands. Narrow fringes of smooth cordgrass are sometimes found where dominance is shared with a mixture of mangrove species (Palik and Lewis, 1983). Salt marsh areas dominated by cordgrass or needlerush can also be found upland of mangroves and salt flat areas, particularly between major estuaries, in association with open ponds and black mangroves, or on the interior of some larger mangrove islands. In addition, salt "flats" are commonly found which are predominated by one or more of the following plant species: saltwort (*Batis maritima*), glass wort (*Salicornia perennis*), saltgrass (*Distichilis spicata*), keygrass (*Monanthochloe littorali*), seablite (*Suaeda linearis*) and sea ox-eye (*Borrichia* sp.), with some cordgrass (*Spartina* sp.) and needlerush (*Juncus roemerianus*). Salt flats can be found in association with black mangroves or can form a transitional area adjacent to mangrove swamp vegetation (Schomer and Drew, 1982).

Unlike salt and brackish marshes, freshwater marshes are very prevalent in coastal areas adjacent to the AEA area. Freshwater marshes in this area are generally subdivided into five types of vegetation communities: 1) sawgrass marsh (*Cladium jamaicensis*), 2) spike rush - beakrush flats (*Eleocharis cellulosa* and *Rhynchospora tracyi*), 3) maidencane flats (*Panicum hemitomon*), 4) flag - pickerelweed communities (*Thalia geniculata*, *Sagittaria lancifolia* and *Pontederia lanceolata*), and 5) cattail marshes (*Typha* spp.) (Schomer and Drew, 1982). Freshwater marshes are characterized by a high species diversity. Dominance is often shared by several plant species. Deep marshes tend to be dominated by cattails and sometimes arrowhead and water-lillies (*Nymphea elegans*, *N. oderata*, and *Nuphar luteum*). Shallow marshes may be dominated by one or more of the following: sawgrass, maidencane, spike rush, fireflag, and arrowhead. Sawgrass marsh is the most pervasive freshwater marsh type. The Florida Everglades, which covers approximately 2.5 million acres, is 75% dominated by sawgrass (Palik and Lewis, 1983).

Wet prairies form a transition between terrestrial and freshwater wetlands. Three types of wet prairies can be identified: 1) muhly grass prairies (*Muhlenberghia filipes*), 2) muhly grass - narrow beardgrass prairies (*M. filipes* and *Schizachyrium* sp.) and 3) narrow beardgrass - three awngrass - lovegrass prairies. While dominated by grasses, wet prairies are often associated with several species of sawgrasses, rushes, and freshwater marsh plants. Wet prairies are particularly prevalent in the Florida Everglades on either side of Shark River Slough. These areas appear to be drying out due to both natural and manmade causes. Many wet prairie areas are being replaced by drier grass species or invaded by native and exotic trees and shrubs (Schomer and Drew, 1982).

Forested wetlands which occur in coastal areas adjacent to the AEA area consist of cypress ponds and strands, river swamps, hydric hammocks, bayheads, Everglades thickets, and exotic tree areas.

Cypress ponds are circular to irregularly shaped wetland areas which vary in size from 1 to 10 hectares (2.5 to 25 acres). The dominant trees are cypress (Taxodium distichum) although some swamp blackgum (Nyssa biflora) can occur in more northerly cypress ponds. They usually occur in depressions where water is retained due to a semi-permeable clay or hardpan layer. Smaller cypress ponds are often called cypress domes because taller trees occur in the center of the pond and shorter trees around the edges, giving the pond a dome-like appearance. Like cypress ponds, cypress strands are dominated by cypress trees, but willow (Salix sp.), red maple (Acer rubrum), and pond apple (Annona glabra) commonly occur there as well. Cypress strands occur in diffused freshwater streams or sheet flow areas which supply a steady source of flowing water. Cypress grows well in these areas probably due to greater fire protection and nutrient and energy subsidies. Two of the largest strand systems, the Fakahatchee Strand and the Corkscrew Swamp, are located in eastern Collier County (Palik and Lewis, 1983).

River swamps are diverse wetland forests which border streams. The largest river swamp occuring adjacent to the AEA area is the Peace River Swamp (in Charlotte and DeSoto Counties) which covers an area of 2,935 hectares (7,254 acres). Smaller river swamps occur along the Little Manatee, Manatee and Myakka Rivers. River swamps are forested by complex mixtures of cypress, water tupelo (Nyssa aquatica), red maple, sweet bay (Magnolia virginiana), and pond apple (Palik and Lewis, 1983).

Hydric hammocks occur in coastal areas adjacent to the AEA area in two types. The north Florida type is dominated by live oaks (Quercus virginiana) and cabbage palm (Sabal palmetto). They occur on poorly drained soils, soils with constant seepage or soils with high water tables. South Florida hammocks occur on elevated islands surrounded by depressed wetlands. Live oak shares dominance of these areas with pond apple, pigeon plum (Coccolobus diversifolia), poisonwood (Metopium toxifera), mahogany (Swietenia mohogani), and white stopper (Eugenia axillaris) (Palik and Lewis, 1983).

In the lower keys, live oak dominance gives way to thatch palms (Thrinax sp.), Jamaica-dogwood (Piscidia piscipula), mahogany, poisonwood, stopper (Myrtus verrucosa) and blackbead (Pithecellobium keyense) (Schomer and Drew, 1982).

Bay heads are dominated by sweet bay and red bay (Persea borbonia). In south Florida, bay heads also contain coco plum (Chrysobalanus icaco), pigeon plum, dahoon holly (Ilex cassine), and poisenwood (Palik and Lewis, 1983).

Everglades thickets are tree islands surrounded by wet prairies or other fresh water wetlands. They may be dominated by one or several of the cajeput (Melaleuca quinquenervia), and Australian pine (Casuarina equisetifolia). The successful colonization of south Florida by these three tree species has occurred at the expense of such natural freshwater communities as wet prairies, sawgrass and other marsh areas, thickets and other swamps. Management techniques have been instigated in areas such as the Everglades National Park to preserve the natural ecosystems and to control the spread of these exotic invaders (Palik and Lewis, 1983).

Coastal waters adjacent to the AEA area support extensive areas of mangrove swamp vegetation. Mangrove swamps are composed of three species of mangroves: red mangrove (Rhizophora mangle), black mangrove (Avicennia germinans), and white mangrove (Laguncularia racemosa). Buttonwood (Conocarpus erecta) is not a mangrove, but is an important species in the transitional zone from mangroves to uplands. The red mangroves with their aerial prop roots occupy the submerged land at the water's edge in Florida. Black mangroves occupy the upper intertidal zone, interspersed with red mangroves when present, and often form extensive forests behind the reds. On higher ground, buttonwood may dominate. White mangroves are found interspersed as a minor component throughout all these zones or landward of the blacks (USDI, MMS, 1983c and Odum, et al., 1982).

Mangroves tend to be tropical species and do not develop satisfactorily in regions where the annual average temperature is below 19°C (or 66°F). Normally, they do not tolerate temperature fluctuations exceeding 10°C (18°F) or temperatures below freezing for any length of time. The exception is black mangrove, which is found across the northern coast of the Gulf of Mexico. It survives these colder regions by maintaining a semi-permanent shrub form which grows back from the roots after freeze damage (Odum, et al., 1982). All three mangrove species are found throughout the entire coastal range adjacent to the AEA area. Mangrove swamps are most prevalent in southern regions of the Florida Gulf coast (especially in the Ten Thousand Islands and Lower Everglades areas of Collier and Monroe Counties). Collier and Monroe Counties alone account for 66% of the total area of mangroves in the State of Florida (Palik and Lewis, 1983).

Beaches - Sandy beaches and a prominent system of barrier islands extend southward along the Florida Gulf coast as far south as Collier County. Unlike other beach areas along the Gulf of Mexico, many southwest Florida beaches lack the presence of a dune system. Reasons for this include the energy characteristics of the shoreline and the extensive development activities which have occurred along these beaches (Ibid). Many of the beach areas adjacent to the AEA area have been described by Carlton (1977) as coastal strand communities because they lack well-developed dunes. Like dune-bearing beach areas, coastal strand beaches are vegetated by a zone of salt and wind tolerant pioneer species such as sea oats (*Uniola paniculata*), sand spur (*Cenchrus incertus*), railroad vine (*Ipomoea pescaprae*), beach bean (*Canavalia maritima*), beach elder (*Iva imbricata*), and ink berry (*Scaevola plumierie*). Landward of the pioneer zone, salt tolerant shrubs and trees can be found including Australian pines (*Casuarina equisetifolia*), cabbage palm (*Sabal palmetto*), sea grape (*Coccoloba unifera*) gray nicker bean (*Caesalpina crista*) and coin vine (*Dalbergia ecastophyllum*). Beaches provide habitat in the form of nesting, feeding, and resting areas for many species of waterfowl, shorebirds, and seabirds, as well as stop-over areas for migratory bird species. Additionally, the Gulf beaches provide sea turtles with nesting habitats (USDI, MMS, 1984b).

Many beaches adjacent to the AEA area are experiencing a significant amount of erosion. Some areas are in a critical state of erosion (which means that erosion poses a threat to both coastal and inland structures and properties). Natural causes contributing to this problem include the rising sea level on the Gulf coast and barrier overwash which occurs during periods of high tides when wave action transports sand into bays landward of the beach. Manmade causes of erosion include the dredging of inlets and channels (which interferes with the longshore transport of sand that normally would replenish beaches) and the construction of jetties, breakwaters, groins, and revetments (which can also result in similar interference). Under natural conditions, dune areas tend to protect onshore land from erosion and damage. When allowed to shift with seasonal and storm influences, they absorb much of the natural energy from wind and wave action. Dune vegetation interrupts the air flow and causes windblown particles to deposit. Root growth then stabilizes the sand surfaces. Extensive development of beach areas, however, has vastly reduced the active dune regions which can be found on the southwest coast of Florida (Palik and Lewis, 1983).

Barrier islands on the southwest coast of Florida create a series of protected shallow embayments and estuarine areas which support such productive habitats as seagrass beds, saltmarshes, swamps and mangrove stands (depending in part on latitude). These areas provide refuge and feeding areas for many marine vertebrate and invertebrate species and figure predominantly in the overall productivity of the waters surrounding barrier islands (USDI, MMS, 1984b). Barrier islands also provide habitat for terrestrial animals, water fowl, shore birds, and seabirds. The interior of larger barrier islands offers a wide variety of habitats including freshwater and brackish marshes and ponds, pineries, tropical hardwood hammocks, and exotic tree areas.

2. Offshore Habitats

a. Pelagic Environment

The pelagic environment consists of phytoplankton, zooplankton, and nekton. The plankton include all those species in the water column whose general movement geographically is controlled more by the currents than by their own swimming ability (as opposed to the nekton, which includes the fish and squids).

Phytoplankton - Phytoplankton are important as the primary producers of the marine environment. As such they are the starting point in the marine food web, providing food for zooplankton, which in turn provide food for larger marine carnivores. In addition, phytoplankton play a significant role in the world's oxygen-carbon dioxide budget and, in ways as yet incompletely understood, also serve to detoxify (biodegrade) many pollutants found in the Gulf.

Unfortunately, it is impossible to generalize regarding the distribution of phytoplankton in the Gulf of Mexico. It is clear from the data that have been collected to date that concentrations of phytoplankton are distributed in patches of various sizes which move from the prevailing winds and currents. Other factors, poorly understood, affect the size and distribution of the patches, including availability of nutrients and grazing pressure; therefore, predictions regarding specific locations of a patch or species at any given time simply cannot be made (USDI, MMS, 1983a).

In the bay and harbor studies conducted near the AEA area, maximum production of phytoplankton is in the upper portions of bays and decreases towards the mouth. This decrease in primary production continues seaward although species diversity increases (Steidinger, 1973).

Phytoplankton sampling in the northern and eastern Gulf of Mexico has been sparse, intermittent, and mostly unquantitative. The studies which have been made pertain only to the presence of certain species in given areas. In comparison with data recorded for different parts of the Gulf, the eastern Gulf is a more productive area (USDI, MMS, 1983a).

Steidinger (1973) summarized data on phytoplankton in the eastern Gulf and concluded that more data were necessary to understand phytoplankton distributions in that area. She concluded that the northeastern Gulf of Mexico area showed a moderately high phytoplankton standing stock during summer resulting from the upwelling of deep, nutrient-rich water in that area. Studies indicate that diatoms and dinoflagellate species are the numerically dominant offshore phytoplankton, with dinoflagellates demonstrating the greatest species diversity. Under normal circumstances, diatoms greatly outnumber the dinoflagellates. Steidinger also stated that it appears from phytoplankton primary production estimates that the Tampa Bay system is one of the most productive estuaries along the eastern Gulf of Mexico.

Red tides have been documented in the AEA area. Red tides are natural occurrences associated with areas of upwelling or heavy land runoff. One of the plankters which cause the red tide is the dinoflagellate *Ptychodiscus brevis*, all called *Gymnodinium breve*. It normally exists in low concentrations but occasionally blooms forming a "red tide." *P. brevis* produces a neurotoxin which in high concentrations is capable of paralyzing and killing a variety of fish, thus causing the fish kills which normally accompany the red tide (Steidinger, 1973).

Zooplankton - Zooplankton comprise a major link between producers (phytoplankton) and higher trophic levels in the water column. The most abundant zooplankton are the copepods. Other significant members of the zooplankton are chaetognaths, crustaceans, ctenophores, euphausiids, medusae of various species, molluscs, pyrosomes, and a variety of larvae from several phyla (USDI, MMS, 1983a). In the Tampa Bay system, the calanoid copepod *Acartia tonsa* was the major species of zooplankton accounting for 30% of the zooplankton biomass. Larvae of benthic invertebrates contributed 19% and 8% to zooplankton numbers and biomass, respectively. Total zooplankton numbers were seven to nine times greater in the three warm season surveys than in winter collections, while biomass was 8-15 times greater (Hopkins, 1977).

In general, as with the phytoplankton, zooplanktonic species diversity decreases with the decreased salinity, and biomass decreases with distance from the estuary. This was found to be true in the Tampa Bay system and seaward (Hopkins, 1977). Also as with the phytoplankton, it is impossible to generalize about specific location and extent of concentrations of zooplankton due to the extreme patchiness of the phytoplankton on which many zooplankters feed (USDI, MMS, 1983a).

Nekton - Nekton in the AEA area include fishes, marine mammals, reptiles (turtles), cephalopod molluscs, and certain swimming crustaceans such as shrimp and crabs. The most conspicuous forms are the fishes, reptiles, and mammals. Fish faunal studies nearby the Florida Keys, which employed intensive sampling, revealed 517 species including 389 members of the reef community, typically found from the shoreline to a depth of 45m (148 ft). The remaining species consist of demersal, deeper water species, offshore pelagic forms, or transients from adjacent inshore areas (USDI, MMS, 1984b). The fishes of commercial and recreational importance to the AEA area are discussed in Sections III.C.7. and III.C.8. The marine turtles are discussed in the Endangered Species Section (III.B.3). Continental Shelf Associates (CSA) (1984) reported 27 species of marine mammals which have been sighted in the eastern Gulf of Mexico and indicated 12 specific species of cetaceans which may occur nearby the AEA area.

b. Benthic Environment

The benthos of the AEA area is composed of those plants and animals which live in, on, or in close association with the substrate. The benthic algae and seagrasses make up the benthic flora. The benthic marine algae include the bluegreens, reds, browns, and greens. Temperature and light availability are important factors which define the limits of algal species. The inshore Gulf of Mexico from approximately Cape Romano south, is essentially tropical (Collard and D'Asaro, 1973). The availability of hard substrate in the eastern Gulf limits the abundance of benthic algae in the AEA area; the dominant benthic plants nearshore are seagrasses (Humm, 1973). Seagrasses are discussed in Section III.B.1.

Benthic fauna include the infauna (animals which live in the substrate such as burrowing worms and molluscs) and epifauna (animals that live on the substrate such as molluscs, crustaceans, hydroids, sponges, and echinoderms). Shrimp and demersal fish are closely associated with the benthic community (USDI, MMS, 1983b).

The distribution of benthic fauna correlates with physical factors (Defenbaugh, 1976). Substrate and depth are important factors (Collard and D'Asaro, 1973). Temperature and salinity are also important in determining the extent of faunal distribution. Other lesser important factors include illumination, exposure to air, nutrient availability, currents, tides, and wave shock. Defenbaugh (1976) states that distance from shore should also be considered as a major influence on the benthic faunal distribution.

The faunal assemblages of the eastern Gulf are markedly different from those of the western Gulf. The difference is attributed to the calcareous sediments found east of DeSoto Canyon as opposed to the terrigenous muds of the western Gulf.

Two generally accepted faunal zones exist in the Gulf, the Carolinean Province in the north and the Caribbean Province in the south. These provinces are not distinct or exclusive but rather show trends in faunal composition. The length and degree of temperature minima define the limits of benthic species which define the faunal provinces. Both provinces are represented in the AEA area. Carolinean species comprise the shallow shelf communities. Caribbean fauna influence the composition of faunal species in the deep shelf and upper slope communities (Collard and D'Assaro, 1973; and Defenbaugh, 1976).

Defenbaugh (1976) further distinguishes faunal assemblages in the Gulf, including the AEA area, by distance from shore and water depth. The Inner Shelf Assemblage, West Florida Shelf is located on the limestone plateau of the near shore shelf in about 4-20m (13-66 ft) of water. Limestone outcrops frequently protrude through the carbonate or quartz sediments overlying the plateau. Faunal composition is basically Carolinean. The Intermediate Shelf Assemblage, West Florida Shelf exhibits tropically influenced biotic communities on biogenic carbonate substrate. The basically Caribbean species of the assemblage include loggerhead sponges, corals, and tropical algae. Water depth of the intermediate Shelf Assemblages is 20-60m (66-197 ft). The Outer Shelf Assemblage, West Florida Shelf [60-120m (197-394 ft)] fauna is essentially tropical. Foraminiferal tests occur in greater abundance in the sediments with depth. The Upper Slope Assemblage, West Florida Shelf is similar to the Outer Shelf Assemblage with increased amounts of foraminiferal sands and muds. Water depths of this assemblage extend to 200m (656 ft).

Most of the benthic fauna of the deep slope and abyssal plain are not found elsewhere. The 250m (820 ft) isobath defines the truly deep sea fauna. The deep water benthic fauna have been characterized into seven faunal assemblages. Three of these are found in the AEA area. The other four assemblages are located in depths greater than 1,000m (3,281 ft) (Pequegnat, 1983).

The Shelf/Slope Transition Zone [150-350m (492-1,476 ft)] is a very productive part of the benthic environment. Demersal fish are the dominant species, many of them reaching their maximum populations in the zone. Asteroids, gastropods, and polychaetes are common.

The Archibenthal Zone - Horizon A Assemblage is located between 475-750m (1,558-2,460 ft). Although less abundant, the demersal fish are a major constituent of the fauna, as are gastgropods and polychaetes. Sea cucumbers are more numerous. Horizon B at 775-950m (2,542-3,116 ft) represents a major change in the number of species of demersal fish, asteroids, and echinoids which reach maximum populations here. Gastropods and polychaetes are still numerous.

The Upper Abyssal Zone begins at 975m (3,198 ft), about the limit of the 1,000m (3,281 ft) boundary of the AEA area. Although the number of species of demersal fish drops, the number which reach maximum populations dramatically increases. This indicates a group uniquely adapted to the environment. Sea cucumbers exhibit a major increase, and gastropods and sponges reach their highest species numbers here.

An ongoing study funded by MMS (Woodward-Clyde Consultants and Continental Shelf Associates, Inc., 1983a, 1983b, and 1985 and Environmental Science and Engineering, Inc. and LGL Ecological Research Association, Inc., 1985) has used high-resolution, multi-system geophysical surveys, underwater television, and still camera "ground-truth" surveys to broadly classify bottom substrates and benthic biological communities across the southwest Florida Shelf. Much of the remaining discussion in this section is taken from these reports. An integrated interpretation of the early data sets has been published as a Marine Habitat Atlas (Woodward-Clyde Consultants and Continental Shelf Associates, Inc., 1983a).

Generalized distributions of the five seafloor substrate types (Rock Outcrops; Thin Sand Over Hard Substrate; Soft Sand Bottom; Coralline Algal Nodule Layer over Sand; and Algal Nodule Pavement with Coral [*Agaricia* spp.] Accumulations) and nine biological assemblages (two "soft bottom," and seven "live bottom" assemblages) distinguished during this study are shown in Figure III-4. Each biological assemblage "type" includes a distinctive group of dominant organisms readily identified from television observations.

Approximately half of the southwest Florida shelf seafloor videotaped and photographed consisted of Soft Sand Bottom. This bottom type occurred on all transects studied and in all water depths (20 to 200m) (66-656 ft). The Thin Sand Over Hard Substrate bottom type was intermixed with Soft Sand Bottoms on all transects. Taken together, these two sand substrate categories accounted for nearly 90% of the total area studied.

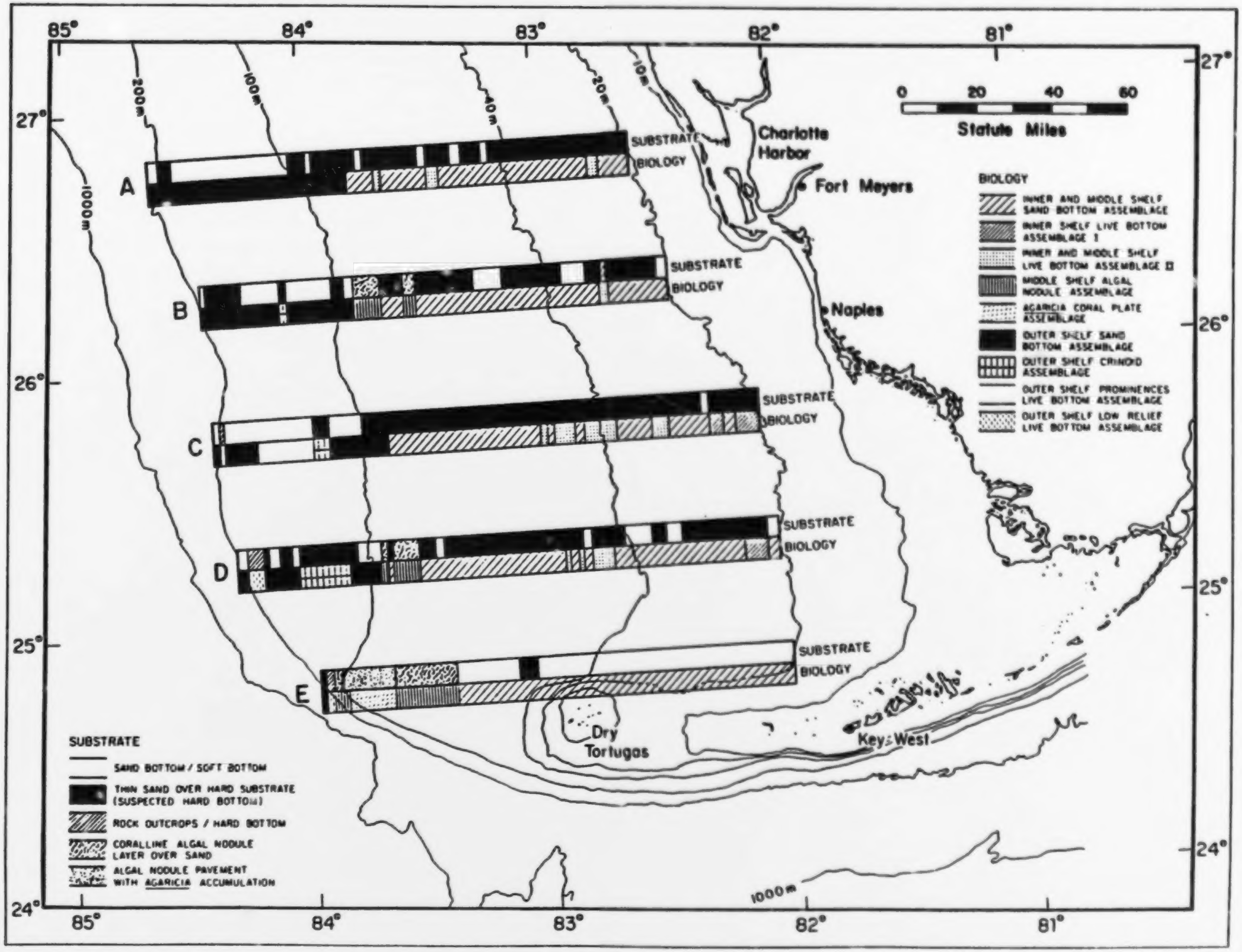
Rock Outcrops, the Coralline Algal Nodule Layer over Sand substrate, and the Algal Nodule Pavement with Coral Accumulations were found scattered primarily in the southern part of the study area. The Coralline Algal Nodule Layer over Sand and Algal Nodule Pavement with Coral Accumulations Substrates may be deeper water successional stages of the Soft Bottom substrate, as suggested in Figure III-5.

An across-shelf analysis of the nine biological assemblages reveals three readily distinguished major biological depth zones: 20 to 60m (66 to 197 ft), 60 to 90m (197 to 295 ft), and 90 to 200m (295 to 656 ft), respectively.

The 20 to 60m water depth zone contained the Inner and Middle Shelf Sand Bottom Assemblage, the Inner Shelf Live Bottom Assemblage I, and the Inner and Middle Shelf Live Bottom Assemblage II.

The 60 to 90m water depth zone contained the previously mentioned Inner and Middle Shelf Sand Bottom Assemblage and Inner and Middle Shelf Live Bottom Assemblage II. The Outer Shelf Sand Bottm Assemblage occurred in this zone as well as in the 90 to 200m water depth zone. The 60 to 90m water depth zone thus appears to be a transition area between the two shelf sand bottom assemblages. The *Agaricia* Coral Plate Assemblage was restricted to this zone, while the Middle Shelf Algal Nodule Assemblage occurred here, but extended out to 100m water depth on Transect E.

The 90 to 200m bathymetric zone was dominated in percent coverage by the Outer Shelf Sand Bottom Assemblage, with the Outer Shelf Crinoid Assemblage,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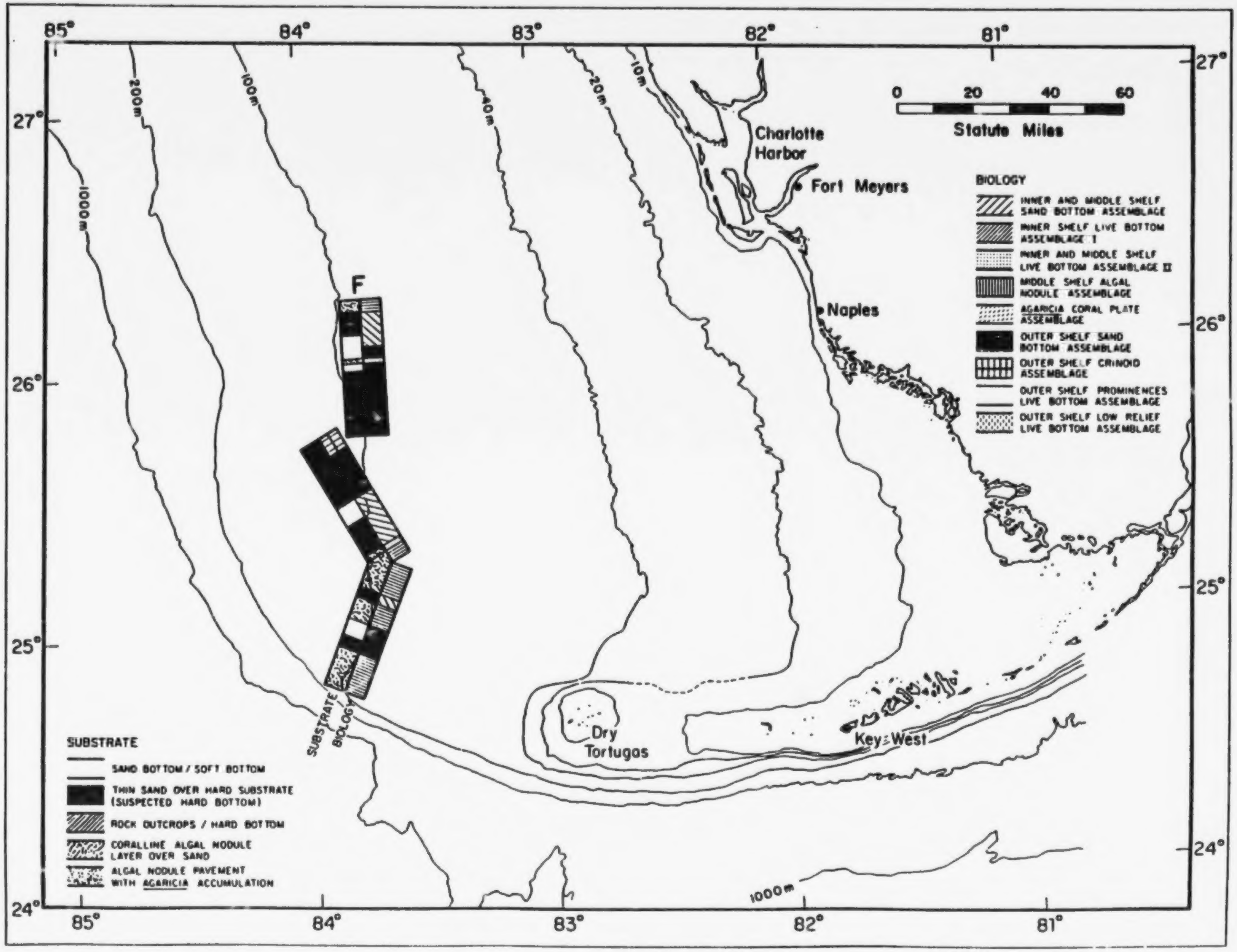
Charlotte Harbor
Fort Meyers
Naples
Dry Tortugas
Key West
A
B
C
D
E
SUBSTRATE
BIOLOGY
BIOLOGY
INNER AND MIDDLE SHELF SAND BOTTOM ASSEMBLAGE
INNER SHELF LIVE BOTTOM ASSEMBLAGE I
INNER AND MIDDLE SHELF LIVE BOTTOM ASSEMBLAGE II
MIDDLE SHELF ALGAL NODULE ASSEMBLAGE
AGARICIA CORAL PLATE ASSEMBLAGE
OUTER SHELF SAND BOTTOM ASSEMBLAGE
OUTER SHELF CRINOID ASSEMBLAGE
OUTER SHELF PROMINENCES LIVE BOTTOM ASSEMBLAGE
OUTER SHELF LOW RELIEF LIVE BOTTOM ASSEMBLAGE
SUBSTRATE
SAND BOTTOM / SOFT BOTTOM
THIN SAND OVER HARD SUBSTRATE (SUSPECTED HARD BOTTOM)
ROCK OUTCROPS / HARD BOTTOM
CORALLINE ALGAL NODULE LAYER OVER SAND
ALGAL NODULE PAVEMENT WITH AGARICIA ACCUMULATION

Figure III-4 Generalized map of marine habitats along Transects A through E.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40
60
Statute Miles
Charlotte Harbor
Fort Meyers
Naples
Dry Tortugas
Key West
SUBSTRATE
BIOLOGY
BIOLOGY
INNER AND MIDDLE SHELF SAND BOTTOM ASSEMBLAGE
INNER SHELF LIVE BOTTOM ASSEMBLAGE I
INNER AND MIDDLE SHELF LIVE BOTTOM ASSEMBLAGE II
MIDDLE SHELF ALGAL NODULE ASSEMBLAGE
AGARICIA CORAL PLATE ASSEMBLAGE
OUTER SHELF SAND BOTTOM ASSEMBLAGE
OUTER SHELF CRINOID ASSEMBLAGE
OUTER SHELF PROMINENCES LIVE BOTTOM ASSEMBLAGE
OUTER SHELF LOW RELIEF LIVE BOTTOM ASSEMBLAGE
SUBSTRATE
SAND BOTTOM / SOFT BOTTOM
THIN SAND OVER HARD SUBSTRATE (SUSPECTED HARD BOTTOM)
ROCK OUTCROPS / HARD BOTTOM
CORALLINE ALGAL NODULE LAYER OVER SAND
ALGAL NODULE PAVEMENT WITH AGARICIA ACCUMULATION

Figure III-4 (continued) Generalized map of marine habitats along Transect F.

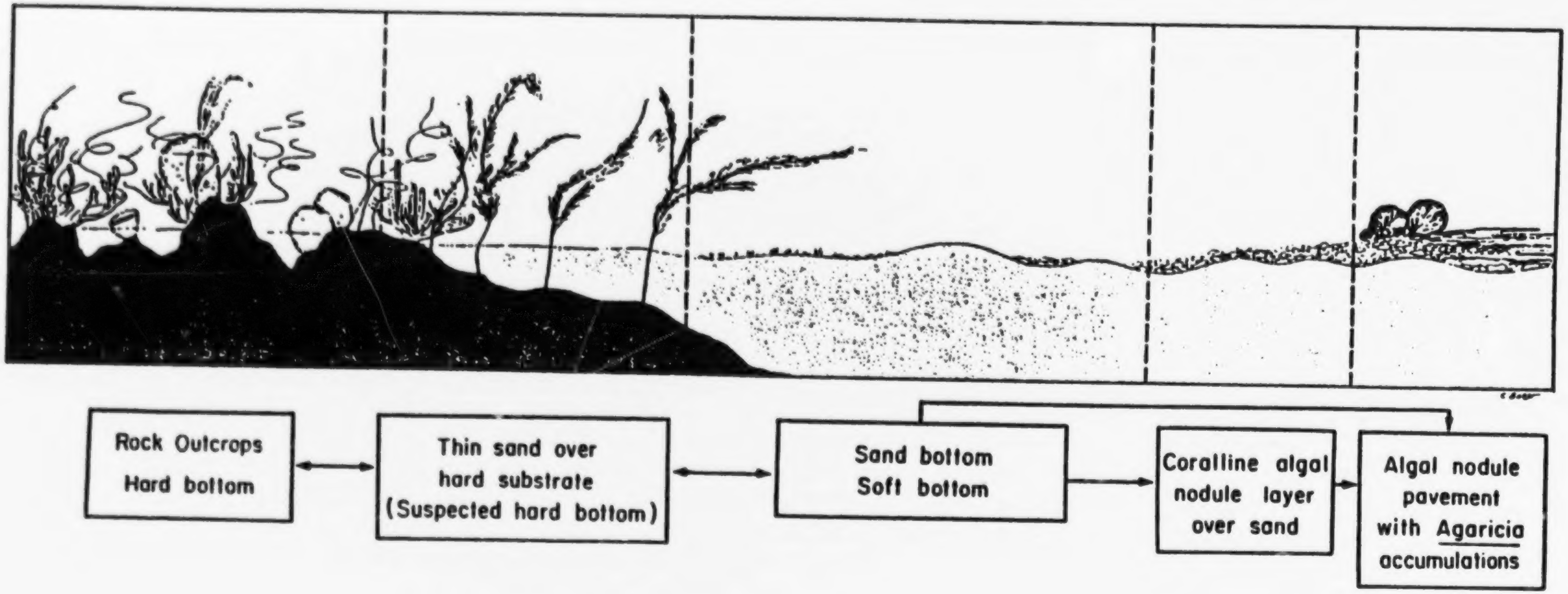

Rock Outcrops
Hard bottom
Thin sand over
hard substrate
(Suspected hard bottom)
Sand bottom
Soft bottom
Coralline algal
nodule layer
over sand
Algal nodule
pavement
with Agaricia
accumulations

Figure III-5 Generalized classification scheme for sea floor substrate types.

the Outer Shelf Prominences Live Bottom Assemblage, and the Outer Shelf Low-Relief Live Bottom Assemblage restricted to this depth zone.

The soft bottoms of the shelf are characterized by a rich, diverse infauna dominated by polychaetes and (to a lesser extent) peracarid crustaceans. The macroepibiota collected in trawls comprise a variety of demersal fishes and crustaceans having different substratum affinities, reflecting, in part, the distribution of scattered live bottom habitat across the otherwise sand-dominated shelf.

The results of infaunal sampling are in general similar to those observed in other continental shelf environments in the Gulf of Mexico, South Atlantic Bight, and the Mid-Atlantic coast. Most shelf habitats are characterized by a diverse and relatively low-density assemblage of polychaetes and peracarid crustaceans (especially amphipods and cumaceans) that compares to less diverse but more abundant infaunal assemblages in nearshore and estuarine environments.

Many of the species, and nearly all of the genera, of common infaunal organisms collected in this study are found in a wide geographic range of shelf environments, though particular species may be associated with particular sediment types and/or bathymetric ranges on any given shelf. The wide geographic range of many infaunal species and genera -- in contrast to that of epibiota -- reflects, in part, the buffering effect of the sedimentary habitat against environmental variations (especially temperature) in the water column.

Faunal densities observed in this study were typical of those previously observed in continental shelf environments and lower than generally observed in estuarine areas. Similar densities of generally less than 10,000 individuals/m^2 have been determined in the South Atlantic Bight and the Mid-Atlantic continental shelf. With a few exceptions, infaunal density was low at the outer shelf stations, a result in accord with previous findings from the eastern Gulf of Mexico. Also, as in the previous results, polychaetes contributed about 60% of the total abundance of infauna.

Species richness in the southwest Florida shelf area was extraordinarily high, about four times that previously reported for the eastern Gulf of Mexico.

Diversity and equitability values determined in this study are typical of continental shelf benthos. Nearshore areas, especially those that are organically enriched or polluted, frequently exhibit low diversity because of dominance by a few opportunistic species. Although seasonal and spatial variations in diversity and equitablility were evident within these data, none of the stations were dominated by one or a few species. Infaunal zonation patterns on the shelf appear to represent primarily bathymetric and sediment-type groupings.

Macroepibiota collected in otter trawls in the study area comprised a variety of fishes, crustaceans, other motile invertebrates, and scattered sessile epibiota. Comparisons of species richness and catch with results of other studies are not warranted due to differences in sampling gear, degree of replication, and area covered, etc.

The southwest Florida shelf provides a large area of scattered hard substrates (some emergent, but most covered by a thin veneer of sand) that allow the establishment of a tropical hard bottom biota in what must be regarded as a marginally suitable environment. The only high-relief features, a series of shelf-edge prominences which are probably the remnants of extensive calcareous algal reef development prior to sea level rise, are now too deep to support active coral communities. Most major reef-building corals are restricted to relatively shallow waters; conditions in shallow waters of the southwest Florida shelf are apparently unsuitable, whether due to occasional cold fronts, turbidity, sediment movement, etc., to allow the establishment of any extensive hermatypic coral populations on the inner shelf. The growth of coralline algae at mid-shelf depths (60 to 80m) (197-262 ft), which results in the production of algal nodules and a crustose algal payment in the southwest portion of the study area, provides an extensive substrate for the development of deepwater hermatypic corals. The coral Agaricia sp., with its platelike growth form, is adapted to maximize light capture at these depths, and the sharp lower depth limit of its occurrence in the study area (about 80m) (262 ft) suggests light limitation. The coralline algal nodule and algal pavement/ Agaricia assemblages represent the nearest to the development of an active reef habitat on the shelf. The remaining hard bottom areas scattered across the broad shelf, whether consisting of exposed or thinly covered hard bottom, are generally colonized by seasonal algae, sponges, and other filter feeders of mixed warm-temperature (Carolinean) and tropical (Caribbean) affinities. The tropical biota consists primarily of the hardier, more tolerant forms (including, for example, the hard corals Siderastrea sp. and Solenastrea sp.).

In summary, on the Florida shelf, shelfwide and seasonal patterns in the composition of live and soft bottom assemblages and the abundance of the component biota presumably reflect the influence of a suite of environmental variables on the recruitment, survival, growth, and reproduction of benthic organisms. Among the important variables are depth and hydrographic variables (temperature, salinity, dissolved oxygen, transmissivity, and inorganic nutrients). Several sediment grain size variables are important in the soft bottom areas. Station depth emerged as a major discriminating "variable"; the usefulness of depth as a discriminator is believed to reflect depth-related trends in environmental variables such as temperature, light, nutrients, and substratum quality. Depth as a correlate of time-averaged environmental conditions has more explanatory value than do "point" measurements of other environmental variables. Sediment grain size variables emerged as significant discriminators of soft bottom station grouping, reflecting the recognized importance of sediment characteristics as determinants of its suitability as a habitat and food source for deposit-feeding infauna. Inorganic nutrient (nitrate, phosphate) levels emerged as potential influences on the distribution of live bottom assemblages, though the causal mechanism for such influences is not known; several direct or indirect pathways of influence are possible.

Two peculiarities of the physical environment of the southwest Florida shelf have important influences on the distribution of assemblages and the abundance of biota. The first is the Loop Current, which passes southward along the shelf edge and generates geostophic upwelling of cold, nutrient-rich water onto the outer shelf. Enhanced water column productivity due to nutrient enrichment is well-documented and could provide substantial partiulate organic inputs to outer and middle shelf benthos; these inputs are potential food sources for surface deposit-feeding infauna and suspension-feeding sessile epibiota. The second peculiarity is the existence of a north-trending subsurface reef complex in 70 to 90m depths, where the Agaricia coral-plate assemblage occurs. Farther north along the mid-shelf buried reef complex, live bottom is increasingly sparse due to the submergence of the feature beneath the increasingly thick veneer of unconsolidated sediments.

Since a live bottom survey and in many instances a photodocumentation survey of the benthic environment are required for activities in water depths of less than 200m (656 ft), specific benthic organisms or assemblages will be discussed in an SEA. See Section IV.B.2.b(3) for details on live bottom survey requirements.

c. Sensitive Underwater Features

The hard and live bottom areas of the eastern Gulf have been determined to be productive areas which warrant protection. Lease stipulations, which are designed to conserve the live bottom areas, have therefore been formulated. The lease stipulation defines live bottoms as seagrass communities; or those areas which contain biological assemblages consisting of such sessile invertebrates as sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozoans, or corals; or those areas whose lithotype favors the accumulation of turtles, fishes, and other fauna.

Live bottom areas are scattered throughout the assessment area. Live bottoms are often associated with hard bottoms. Many sessile invertebrates need a hard substrate for attachment and therefore cannot live on sand or soft bottom. Consequently, limestone outcroppings and pinnacles are often inhabited by these fauna. Due to the high productivity of the live bottoms, in terms of both attached biota and as habitat for important fish species, and the limited distribution of hard bottom areas, those hard bottom areas which support live bottom assemblages have been designated for protection. Other live bottom assemblages are able to grow on coarse sand substrate. These live bottom patches are also scattered throughout the AEA area. These live bottoms are productive areas which are considered within the scope of the lease stipulation. See Section III.B.2.b. for further discussion of these live bottoms.

Seagrass beds are included in the definition of live bottoms and would be among those sensitive underwater features which may be worthy of additional protection. Seagrasses are discussed in Section III.B.1.

The specific live bottoms located within the area of a proposed activity will be discussed in an SEA.

3. Endangered or Threatened Species

A number of federally designated endangered and threatened species of animals occur, either on a permanent or on a transitional basis, within or adjacent to the area encompassed by this AEA. The general location of selected endangered/threatened species within or adjacent to the project area can be found on Visual No. 3 of the Environmental Impact Statement (EIS) for Sales 94, 98 and 102 (USDI, MMS, 1984b).

Five federally listed endangered whale species (fin, humpback, right, sei, and sperm whales) occur in the eastern Gulf of Mexico. Schmidly (1981) documented historical strandings, sightings, and captures of these species. Fin whales often come close to shore in pursuit of fish (which may account for their frequent sightings and strandings observed in the North Atlantic). One sighting has occurred near Boot Key in Monroe County and one stranding was recorded in Florida Bay off of Man-O-War Key. Both areas are immediately adjacent to the AEA area indicating the presence of fin whales in the AEA area. Based on capture data, humpback whales are a coastal species. Most captures have taken place on the Atlantic coast of south Florida or east of the Florida Keys, however, one capture has been documented in the AEA area southeast of Sanibel Isalnd within 40 miles of the Florida coastline. The only recent record of this species occurring near the AEA area was an individual sighted in 1962 at the mouth of Tampa Bay. Right whales are most commonly observed along the Atlantic coast from North Caroline to Florida during their winter and spring migrations.

The endangered West Indian manatee occurs commonly in coastal waters adjacent to the AEA area. The total population of manatees in Florida has been estimated between 750 to 850 individuals of which 350 to 400 inhabit Gulf coastal areas (Palik and Lewis, 1983). Manatees are generally found in slow-moving rivers, estuaries, and salt-water bays. They require channels at least 1.5 to 2 meters (4.9 to 6.6 ft) deep for migration. During the winter, manatees are found on the Florida Gulf coast from Florida Bay to Crystal River. Winter manatee populations tend to focus in south Florida or near sources of warm water. During the summer, however, manatees will feed in inshore waters and may spread northward as far afield as New Orleans (Applied Biology, Inc., 1972). The U.S. Fish and Wildlife Service (FWS) has established designated critical habitats for the protection of this species and the State of Florida has established manatee sanctuaries. These protective zones traverse the inshore areas adjacent to the eastern AEA boundary line (Palik and Lewis, 1983).

Four Federally listed endangered marine turtle species (leatherback, Atlantic green, Atlantic hawksbill, and Atlantic ridley turtles) and one threatened species (loggerhead turtle) can be found in waters of southwest Florida. The loggerhead turtle wanders widely throughout the Gulf and has been found as far as 805m (500 mi) out in the open sea. Loggerheads nest on barrier islands and beaches of the southwest Florida coastline adjacent to the AEA area from Cape Sable northward. Nesting also occurs in the Dry Tortugas at the southern boundary of the AEA area (USDI, MMS, 1983a). The Atlantic hawksbill turtle is the only other of the five turtle species where nesting has been documented on the Florida west coast. It occurred on Longboat Key (Manatee County) in May 1980 (Palik and Lewis, 1983). The hawksbill turtle is found near coral reefs and rocky outcroppings in shallow coastal areas. They are often observed in reef areas off the coast of Florida and in the Florida Keys. Atlantic ridley turtles feed in the inshore waters along the Gulf coasts of Mexico, Texas, Louisiana, and Florida. They are also regularly sighted in the Florida Keys. They are believed to nest only on one remote sand bar beach on the Gulf coast of Mexico (Van Meter, 1983). Atlantic green turtles are listed as endangered in Florida waters and threatened throughout the rest of its range. They may be found throughout the Gulf, but favored habitat for the turtle is lagoons and shoals which provide an abundance of marine grass and algae. No recent nesting has been reported for green turtles on the Florida Gulf coast. Leatherback turtles are the most pelagic marine turtle and may be found near the continental shelf edge. Sightings have been reported along the Gulf coast in March and April. No recent nesting of leatherbacks has been reported along the Florida Gulf coast (USDI, MMS, 1983a).

The American crocodile is listed as endangered by the FWS. It occurs in extreme southern Florida where it inhabits coastal mangrove forests as well as saline and brackish embayments and creeks. Breeding range adjacent to the AEA area is confined to eastern Florida Bay, although they do move into other areas. Another population has been reported in the lower Florida Keys in the vicinity of the Key Deer National Wildlife Refuge, but breeding in this area has not been documented.

The American alligator was once listed as endangered by the FWS, but this status has been reduced to threatened due to alligator population increases. The alligator occurs throughout Florida in interior wetland habitats, occasionally entering brackish and saline wetlands (Palik and Lewis, 1983).

The Key deer is considered by the FWS to be endangered. It is the smallest race of North American deer and inhabits a few islands in the lower

Florida Keys, mainly Little Pine and Johnson Keys with occasional sightings on Sugarloaf Key. Habitat requirements include extensive pinewoods and hardwood hammocks and a permanent supply of freshwater (Palik and Lewis, 1983).

The Florida panther is probably the only population of panthers in the eastern United States. This endangered species numbers less than 30 individuals. In southwest Florida, breeding occurs in an area which encompasses the Fakahatchee Strand (in Collier County), Big Cypress Swamp, and portions of the Everglades National Park. Panthers require large amounts of undisturbed territory in which to hunt and are capable of traveling great distances (Ibid).

The bobcat is found in most counties in southwest Florida. The status of this species is currently under review by the FWS. While it is most commonly found in sand pine scrub forests, the bobcat can be found in almost any of the coastal habitats adjacent to the AEA area as well (Woolfenden, 1983).

The southern bald eagle is an endangered species found in coastal areas adjacent to the AEA area. While typically a coastal species, it is also found near larger lakes and rivers. In coastal areas of southwest Florida, nesting usually occurs in mangroves. Currently the breeding population in Florida is estimated at 300 pairs. The endangered Florida Everglade kite is presently found only in the upper St. Johns River watershed, western Lake Okeechobee , and northern areas of the Everglades National Park. It feeds exclusively on the freshwater apple snail and requires expansive areas of freshwater marsh and shallow open water. This species numbers slightly over 100 individuals. The peregrine falcon is an endangered bird which migrates through coastal areas adjacent to the AEA area and sometimes winters there. They require habitat which offers a dependable supply of waterfowl and shore birds, which are its major prey items. Wintering birds arrive in Florida by September or October and usually depart by May. The red-cockaded woodpecker is found in most of the coastal counties of south-west Florida, although it occurs most rarely in the southern reaches of the State. It inhabits mature stands of southern pine, typically with an open understory. It is considered endangered by the FWS. The Cape Sable seaside sparrow is also an endangered bird. It is found only in Collier and mainland Monroe counties and inhabits interior freshwater and brackish marshes of the extreme southern Florida peninsula. Federally designated critical habitat has been established in the Taylor Slough region of the Everglades National Park (Palik and Lewis, 1983). Marians marsh wren is listed as a species of special concern by the FWS. It is a distinct race of long-billed marsh wrens that are found only in saltwater marshes dominated by _Juncus_ and cordgrass. Breeding populations of the marsh wren are no longer found south of Pinellas County on the Florida Gulf coast, but individuals may occur along Tampa Bay and Charlotte Harbor (Woolfenden, 1983).

The Swannee cooter is a turtle species occurring only in saltwater marshes at the mouths of the Hillsborough and Alafia Rivers in Hillsborough County. Its status is currently under review by the FWS. The Miami black-headed snake is also currently under review. Little is known regarding its life history; however, it exists only in a small area of Dade and Monroe Counties. Specimens have been collected in pine flatwoods, pastures, and tropical hammocks in the Keys (Woolfenden, 1983). The threatened eastern indigo snake can be found in coastal counties adjacent to the AEA area. It inhabits dry sandy areas, pine flatwoods, and moist tropical hammocks in peninsular Florida and the Florida Keys (Palik and Lewis, 1983).

The silver rice rat is found only on a small freshwater marsh on Cudjoe Key (in the lower Florida Keys). Little is known of the recently discovered species, and its range could extend to nearby Keys. Its status is under review by the FWS. Similarly, two other species under review are the Key Largo cotton mouse and the Key Largo woodrat. Both species inhabit only mature tropical hardwood hammocks on the northern portion of Key Largo (in the Florida Keys). Their populations have been severely reduced by human development (Palik and Lewis, 1983).

Two invertebrates, listed as threatened by the FWS, are also found in the Florida Keys. The Stock Island tree snail occurs only in a small tropical hammock on Stock Island (in the lower Florida Keys). Schaus' swallowtail butterfly occurs only in tropical hammocks containing the host plant torchwood on northern Key Largo and Elliot Key (Palik and Lewis, 1983).

The specific endangered or threatened species located within the area of a proposed activity will be addressed in an SEA.

4. Breeding Habitats and Migration Routes

Several species of waterfowl utilize the Atlantic and Mississippi flyways during migration into or through the eastern Gulf of Mexico region. The major overwintering location within or adjacent to the project area is Charlotte Harbor. Additionally, overwintering occurs in the coastal areas of Collier and Monroe Counties. The nearshore island beaches and coastal marshes of this region are inhabited by numerous species of colonial nesting and wading birds, including resident and migrant species.

Pelagic fishes make seasonal movements up and down the west Florida coast. In the spring, king and Spanish mackerel leave the wintering grounds of south Florida and migrate along the continental shelf to their spawning and summering areas in the northern Gulf, including the AEA area.

Various species of terns have established rookeries along the beaches and nearshore islands. The brown pelican nests on the coastal beaches adjacent to the AEA area. The beaches of the AEA area are also used by marine turtles for nesting. See Section III.B.3. and Visual No. 3 of the EIS for Sale 94, 98, and 102 (USDI, MMS, 1984b) for further information on turtle nesting.

The estuarine areas of the AEA area are important nursery areas for several species. The Charlotte Harbor Bay, Florida Bay, and coastal areas of Collier and Monroe Counties are important nursery areas for pink shrimp. The stone crab and spiny lobster are major commercial species within Monroe County area, which uses the Florida Bay and the Florida Keys as part of their nursery habitat (Visual No. 10, USDI, MMS, 1984b).

The Atlantic blue crab migrates north-northwest through the inshore waters of the AEA area. This migration is undertaken by the female of the species only, and to specific spawning areas. Spawning takes place offshore and in high salinity estuaries. Adult males tend to remain in the estuaries throughout the year. One of the principal spawning area for the blue crab along the Florida southwest coast is in the Tampa Bay area (Steele, 1984).

King and Spanish mackerel spawn over the continental shelf in the AEA area. Their nursery area is probably the shallow portion of the shelf. Billfishes also spawn off northern Florida mostly beyond the continental shelf. Fishes wintering in Florida Bay migrate into the northeastern Gulf in the spring and return by the following winter (Palik and Lewis, 1983).

5. Protected Areas of Biological Concern

Protected areas of biological concern include National, State, local and private parks, refuges, preserves, wilderness areas, sanctuaries and wildlife preservation areas. These areas are especially abundant in the southwest Florida coastal area because of the unique diversity of biota which can be found there. In some cases these areas serve as critical habitat for one or more of the many threatened or endangered species found in South Florida or because the areas serve as rookeries to the rich variety of birds found there. In other instances, areas were established to preserve a biological feature such as coral reefs on the Big Cypress Area. Refer to Visual 4-II of the (EIS) Sales 94, 98, and 102 for the locations of many of the areas which will be discussed (USDI, MMS, 1984b). A discussion of recreation areas can be found in Section III.C.8. of this AEA.

Everglades National Park encompasses an area of 1,560 square miles in Dade, Monroe and Collier Counties. Although the park is most popularly known as the "river of grass," a large variety of diverse habitats in addition to the well known sawgrass glades can be found within the park boundaries, including pine rocklands, hardwood hammocks, mangrove swamps, cypress and freshwater swamps, coastal prairies, and Florida Bay with its associated estuaries and seagrasses (George, 1972). This diversity of habitats supports a wide variety of rare and endangered animals including the southern bald eagle, the Florida panther, West Indian manatee, Everglades mink, Atlantic green turtle, loggerhead turtle, brown pelican, Florida sandhill crane, Everglade kite, short-tailed hawk, peregrine falcon, Cape Sable sparrow, roseate spoonbill, and American crocodile. The American alligator, reddish egret, Florida mangrove cuckoo, osprey, and the round-tailed muskrat are also found within the park boundaries. The Everglades National Park encompases some very fragile, unique subtropical habitats. The greatest danger to the Everglades at present appears to be low water levels caused by interrupting the pattern of waterflow over the glades which accompanies development activities in South Florida (Palik and Lewis, 1983).

The Big Cypress National Preserve is located on a 430,000-acre tract in Collier, Dade, and Monroe Counties. Rare fauna found within the preserve include the Everglade kite, the southern bald eagle, American alligator, Florida black bear, and the Florida panther (Beccasio, et al., 1982).

Seven national wilderness areas are located in Southwest Florida. They were established by Congress as permanent preserves and wilderness areas which will be forever off-limits to incompatible human activities. Portions of park areas, wildlife refuges, etc. are included in the seven designated national wilderness areas (Palik and Lewis, 1983). Table III-6 lists these seven areas and their locations and sizes.

Eleven National wildlife refuges have been established in southwest Florida. These areas serve as a haven for endangered wildlife and provide safe nesting areas for a variety of birds. Most are limited purpose outdoor recreation areas designed for nature study, natural scenery appreciation, photography, hiking, and picnicking (Palik and Lewis, 1983). Table III-7 lists the National wildlife refuges, and their location, size, and habitat utilization.

Two National marine sanctuaries are found in southwest Florida. Key Largo National Marine Sanctuary is located in Monroe County southeast of Key Largo on the only true coral reefs found along the continental U.S. Coast (the Florida reef tract). Looe Key National Marine Sanctuary is also located on the Florida reef tract and is approximately 30 miles east-southeast of Key West. Both areas protect the extremely complex coral reef ecosystem which supports more plant and animal species than does any other marine ecosystem (Palik and Lewis, 1983).

Table III-6

National Wilderness Areas

National Wilderness Area	Location	Acreage
Everglades	Monroe Co. Collier Co.	1,296,500
Great White Heron	Monroe Co.	1,855
Island Bay	Charlotte Co.	20
J.N. "Ding" Darling	Lee Co.	2,619
Key Deer	Monroe Co.	2,278
Key West	Monroe Co.	2,019
Passage Key	Manatee Co.	36

Source: Palik and Lewis, 1983.

Table III-7

National Wildlife Refuges

Name	County	Acreage	Endangered Wildlife	Nesting Bird Colonies
Pinellas	Pinellas	394	W. Indian Manatee Bald Eagle Brown Pelican American Alligator Sea Turtles Wood Stork	Great Egret Great Blue Heron Yellow Crowned Night Heron White Ibis
Egmont Key	Hillsborough	350	W. Indian Manatee Bald Eagle Brown Pelican Red Cockaded Woodpecker Sea Turtles	(none)
Passage Key	Manatee	36	W. Indian Manatee Bald Eagle Brown Pelican American Alligator Sea Turtles	Black Skimmer Laughing Gull Royal Tren Sandwich Tern Least Tern American Oystercatcher

Table III-7
(Continued)

Name	County	Acreage	Endangered Wildlife	Nesting Bird Colonies
Island Bay	Charlotte	20	W. Indian Manatee Bald Eagle Brown Pelican Red Cockaded Woodpecker American Alligator Sea Turtles	Bald Eagle Laughing Gull Royal Tern Caspian Tern Snowy Egret Great Egret Great Blue Heron
Pine Island	Lee	646	W. Indian Manatee Brown Pelican Red Cockaded Woodpecker American Alligator Sea Turtles	Brown Pelican Great Blue Heron Great Egret Little Blue Heron Snowy Egret Louisiana Heron White Ibis
Matlacha Pass	Lee	125	W. Indian Manatee Brown Pelican Red Cockaded Woodpecker American Alligator	Great Egret Cattle Egret Brown Pelican Double Crested Cormorant Snowy Egret Louisiana Heron Little Blue Heron Anhinga
Caloosahatchee	Lee	40	W. Indian Manatee Brown Pelican Red Cockaded Woodpecker American Alligator Sea Turtles	Cattle Egret Louisiana Heron Great Blue Heron Little Blue Heron Great Egret Snowy Egret
Jay N. "Ding" Darling	Lee	4,788	W. Indian Manatee Brown Pelican Red Cockaded Woodpecker American Alligator Sea Turtles Arctic Peregrine Falcon Bald Eagle	Bald Eagle

Table III-7
(Continued)

Name	County	Acreage	Endangered Wildlife	Nesting Bird Colonies
Key Deer	Monroe	5,444	W. Indian Manatee Key Deer Florida Manatee Arctic Peregrine Falcon Bald Eagle Brown Pelican American Alligator American Crocodile Sea Turtles	Brown Pelican Great Blue Heron Double-crested Cormorant Great White Heron
Great White Heron	Monroe	6,202	Key Deer W. Indian Manatee Arctic Peregrine Falcon Bald Eagle Brown Pelican American Alligator American Crocodile Sea Turtles	Double-crested Cormorant Great White Heron Great Blue Heron Laughing Gull White Ibis Brown Pelican Louisiana Heron Little Blue Heron Reddish Egret
Key West	Monroe	2,019	W. Indian Manatee Arctic Peregrine Falcon Bald Eagle Brown Pelican Sea Turtles	Magnificent-Frigatebird Double-crested Cormorant Great Blue Heron Brown Pelican

Source: Palik and Lewis, 1983.

Rookery Bay National Estuarine Sanctuary is the only National estuarine sanctuary located in southwest Florida. It is located south of Naples in Collier County. The sanctuary protects one of the last pristine estuarine areas remaining on Florida's southwest coast (Palik and Lewis, 1983)

There are five National Audubon Society Sanctuaries located in southwest Florida. Table III-8 provides a list of these sanctuaries, and their location, size, and habitat usage.

Table III-8

National Audubon Society Sanctuaries

Sanctuary	County	Acreage	Endangered Wildlife	Nesting Bird Colonies
Tampa Bay	Hillsborough	N.A.[a]	Brown Pelican	Herons, Egrets, Ibises, Terns
Corkscrew	Collier	11,000	Fla. Panther, American Wood Stork	Wood Stork, White Ibis
Rookery Bay	Collier	5,000		
Big Pine Key	Monroe	747	Key Deer	
Cowpens Key	Monroe	10		Roseate Spoonbills, White Herons, Frigatebirds

a - Not available
Source: Palik and Lewis, 1983.

The National Natural Landmarks Program was established to assist in the preservation of a variety of significant natural areas which will illustrate part of the diversity of the country's natural heritage (Palik and Lewis, 1983). Table III-9 lists the three natural landmarks found in southwest Florida.

Table III-9

National Natural Landmarks

	Corkscrew Swamp National Audubon Society Sanctuary	Big Cypress	Lignumvitae Key
County	Collier	Collier	Monroe
Size	11,000 acres	650 acres	240 acres
Description	Florida's last large stand of virgin bald cypress; wide wildlife variety contains one of two remaining colonies of Wood Stork, only American member of stork family.	215 acres of virgin cypress; one of largest remaining cypress stands in Florida	Unusual high outcropping of coral

Source: Palik and Lewis, 1983.

State parks and recreation areas are discussed in Section III.C.8. of this AEA; however, it should be noted that John Pennekamp Coral Reef State Park occupies a 55,012-acre area immediately adjacent to Key Largo National Marine Sanctuary (in Monroe County southeast of Key Largo). Like the National Marine Sanctuary, the park encompases and preserves an area of the Florida reef tract (Palik and Lewis, 1983).

The Town Islands State Wilderness Area is the only state wilderness area which lies adjacent to the AEA area. It is a 55-acre tract located in the offshore islands of Manatee County (Palik and Lewis, 1983).

Three State wildlife management areas can be found in areas adjacent to the AEA area. The Florida Game and Fresh Water Fish Commission maintains an active habitat improvement program in these areas which includes controlled burning, water fowl impoundments, and hardwood tree planting (Palik and Lewis, 1983). Table III-10 lists these areas, their location, size, and habitat utilization.

Table III-10

State Wildlife Management Areas

Wildlife Management Areas	County	Acreage	Endangered Wildlife	Nesting Bird Colonies
Big Cypress	Monroe/ Collier	540,000	American Alligator Mangrove Fox Squirrel Florida Panther Wood Stork Red Cockaded Woodpecker Bald Eagle	Bald Eagle Cattle Egret Great Egret Little Blue Heron
Cecil Webb	Charlotte	62,500	American Alligator Wood Stork Red Cockaded Woodpecker Bald Eagle	Cattle Egret Great Egret Little Blue Heron
Lower Hillsborough	Hillsborough	5,000	American Alligator Wood Stork Bald Eagle	Bald Eagle Great Blue Heron

Source: Palik and Lewis, 1983.

Florida's Aquatic Preserves were established to preserve State-owned submerged lands in areas which have exceptional biological, aesthetic and scientific value. Twelve aquatic preserves are located in southwest Florida. They are: Pinellas County, Boca Ciega, Cockroach Bay, Cape Haze, Gasparilla Sound-Charlotte Harbor, Matlacha Pass, Pine Island Sound, Estero Bay, Rookery Bay, Cape Romano-Ten Thousand Islands, Coupon Bight, and Lignumvitae Bay (Palik and Lewis, 1983).

The Florida legislature established the Conservation and Recreation Lands (CARL) Trust Fund to provide a means of acquiring and managing environmentally endangered lands and other lands for recreation, water management, and preservation of significant archaeological and historic sites (Palik and Lewis, 1983). A list of lands purchased under the Land Conservation Act of 1972 and under the new CARL Program established in 1979 is found in Table III-11.

Table III-11

Conservation Lands

Lands Purchased Under Land Conservation Act of 1972	Proposed Lands to be Purchased Under 1979 CARL Program	County
Weedon Island		Pinellas
Charlotte Harbor		Charlotte, Lee
Cayo Costa - North Captiva Islands		Lee
Barefoot Beach		Lee, Collier
Fakahatchee Strand		Collier
Big Cypress National Preserve		Collier, Lee
	Little Gator Creek Woodstork Rockery	Pasco
	Double Branch Bay/Bower Tract	Hillsborough
	Cockroach Key	Hillsborough
	Horton Property/Snead Island	Manatee
	Oaks/Palmer Estate	Sarasota
	Charlotte Harbor	Charlotte
	Sixmile Cypress Swamp	Lee
	Josslyn Island	Lee
	Fakahatchee Strand	Collier
	Rookery Bay	Collier
	New Mahogany Hammock	Monroe

Source: Palik and Lewis, 1983.

C. SOCIOECONOMIC CONDITIONS AND CONCERNS

The socioeconomic impact area used for an assessment of economic and demographic conditions (III.C.1.), land use (III.C.2.), and onshore support facilities (III.C.3.) differs from the AEA coastal area used for an assessment of impacts to the other resources and uses discussed in Section III.C. in that it includes adjacent Florida counties which have established oil and gas infrastructure (Figure III-6).

1. Economic and Demographic Conditions

a. Related Employment and Area Unemployment

Average employment and unemployment data for September 1984 (including onshore and offshore employment) for the affected area [including coastal and adjacent counties which have established oil and gas infrastructure as indicated on Visual No. 7 (USDI, MMS, 1984b)] are given in Table III-12.

Table III-12

Area Employment/Unemployment Rate

Area	Employment	Unemployment Rate
Florida Counties		
Hillsborough	358,646	4.7
Pinellas	329,248	4.1
Manatee	72,661	4.8
Sarasota	89,674	4.3
Charlotte	22,519	5.2
Lee	109,584	4.7
Collier	37,739	10.7
Monroe	23,639	4.2

Source: Florida Department of Labor and Employment Security, 1984.

The following selected Standard Industrial Classification (SIC) codes serve to further identify employment in the oil and gas industry for the affected socioeconomic impact area:

13 - oil and gas extraction
29 - petroleum and coal products
3533 - oil field machinery
46 - petroleum pipelines
492 - gas production and distribution
517 - petroleum and petroleum products

SIC 13 is considered the primary industry while the others indicate secondary industries. Tertiary industries are not included. Table III-13 gives the appropriate levels of employment by county for 1980. A distinct category for offshore employment figures was not included.

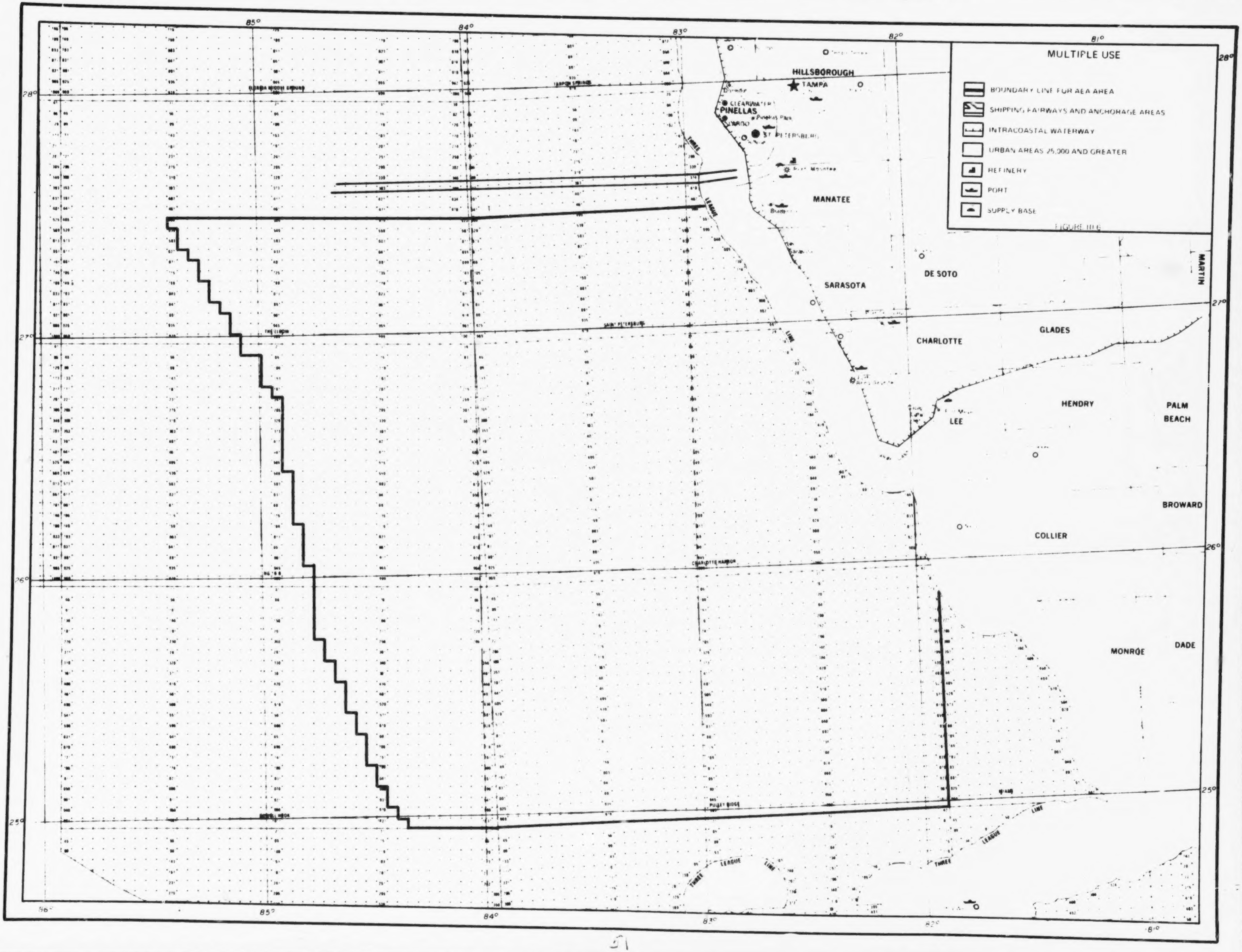

MULTIPLE USE
BOUNDARY LINE FOR AEA AREA
SHIPPING FAIRWAYS AND ANCHORAGE AREAS
INTRACOASTAL WATERWAY
URBAN AREAS 25,000 AND GREATER
REFINERY
PORT
SUPPLY BASE
85°
84°
83°
82°
81°
86°
28°
27°
26°
25°
HILLSBOROUGH
TAMPA
Dunedin
CLEARWATER
PINELLAS
Pinellas Park
LARGO
ST PETERSBURG
Port Manatee
MANATEE
Bradenton
Sarasota
SARASOTA
DE SOTO
MARTIN
CHARLOTTE
GLADES
HENDRY
PALM
BEACH
LEE
BROWARD
COLLIER
MONROE
DADE
THREE
LEAGUE
LINE
FLORIDA MIDDLE GROUND
TARPON SPRINGS
THE ELBOW
SAINT PETERSBURG
CHARLOTTE HARBOR
PULLEY RIDGE

FIGURE III-6

Table III-13

Number of Employees

Area	SIC 13	SIC 29	SIC 3533	SIC 46	SIC 492	SIC 517
Florida Counties						
Hillsborough	66	269	0	0	175	939
Pinellas	0	60	0	0	60	133
Manatee	0	0	0	0	0	78
Sarasota	0	0	0	0	0	0
Charlotte	0	0	0	0	0	0
Lee	0	0	0	0	0	147
Collie	0	0	0	0	0	0
Monroe	0	0	0	0	0	0
TOTAL	66	329	0	0	235	1,297

Source: USDC, BC, 1982.

Table III-13 indicates that employment occurring in the primary industries of the socioeconomic impact area occurs in Hillsborough County. When a range for the employment data was given, the mid-point was used. Approximately 88% of employees working in secondary industries work in Hillsborough and Pinellas Counties. Refer to Sections III.C.1.b. and III.C.1.c. for a discussion of the location and size of related population and industry (primary and secondary) centers.

It should be noted that approximately 110,000 of 130,000 of the jobs associated with offshore (OCS) oil and gas production occur in Louisiana. The socioeconomic conditions and concerns relative to Louisiana are addressed in the Final EIS for Sale Nos. 94, 98, and 102. Minimal employment has been associated with the Federal offshore oil and gas program in the eastern Gulf (USDI, MMS, 1984b).

CSA (1984) reports that exploratory drilling operations would typically require the following types and numbers of employees:

1	Foreman
1	Senior Tool Pusher
1	Tool Pusher
2	Drillers
2	Assistant Drillers
2	Derrickmen
6	Floormen
2	Motormen
2	Crane Operators/Roustabout Foremen
8	Roustabouts
2	Mechanics
3	Electricians
1	Welder
1	Senior Mechanic/Electrician
2	Mud Mixers

2	Painters
2	Storekeepers
1	Rig Safety and Training Representative
1	Barge Operator
2	Watchmen
2	Cooks
3	Cooks' Helpers
1	Cementing Engineer
1	Mud Engineer
51	Total

The employees normally work on a 7-days-on/7-days-off schedule. Other personnel such as casing crews, electric loggers and engineers are flown in on an as-needed basis. The personnel are transient with the majority having residences in Louisiana. Staff employees are temporarily assigned to the onshore base of operations. Vessel crews usually accompany their respective vessels when they move to the site from other areas of the Gulf. A listing of the types and numbers of employees typically found on tugboats, crew boats, and supply boats which support offshore exploratory operations is given in Table III-14.

Table III-14

Vessel Employment

Type	Tugboats		Crew Boats		Supply Boats	
	^{A}	^{B}	^{A}	^{B}	^{A}	^{B}
Captain (Master)*	1	1	1	1	1	1
Mate	0	0	1	0	2	0
Engineer	1	0	1	0	1	0
Assistant Engineer	0	0	0	0	1	0
Able Seaman	0	0	0	0	1	0
Cook	0	0	1	0	1	0
Deckhand	2	1	2	1	2	1

^{A}Length greater than 30m (100 ft)
^{B}Length less than 30m (100 ft)

* If the vessel operates for more than 12 hours per day, two captains are required; otherwise, there is one crew per boat.

Source: University of New Orleans, 1976.

Local labor is sometimes used to accommodate unskilled job requirements. In summary, approximately 140 employees can be involved in an exploratory drilling operation when consideration is given to onshore, transportation, and offshore work requirements.

b. Location and Size of Related Population Centers

Population density - This area varies substantially in socioeconomic patterns ranging from low-density, undeveloped rural areas to high-density, highly developed urban centers. The four Standard Metropolitan Statistical areas (as defined in USDI, MMS, 1984b) within the area under consideration include:

Tampa-St. Petersburg
Bradenton
Sarasota
Fort Myers-Cape Coral

Population growth - Population growth for coastal counties within this AEA area as well as those adjacent counties which have established oil and gas infrastructure (USDI, MMS, 1984b, Visual No. 7) is given in Table III-15.

Table III-15

Area Population

Area	Population 1980	Population 1970	Percent Change 1970 to 1980
Florida	9,739,992	6,791,418	43.4
Hillsborough	646,960	490,265	32.0
Pinellas	728,409	522,329	39.5
Manatee	148,442	97,115	52.9
Sarasota	202,251	120,413	68.0
Charlotte	59,115	27,559	114.5
Lee	205,266	105,216	95.1
Collier		38,040	125.5
Monroe	63,098	52,586	20.0

Source: USDC, BC, 1981.

The average population increase in this socioeconomic assessment area was 68%. State population figures were included for comparison purposes. Florida experienced the highest net migration rate of all Gulf coastal areas. Of the total net migration into the Gulf region, over 60% was into the Florida Gulf coastal area (USDI, MMS, 1984b).

c. Location and Size of Related Industry Centers

The primary industrial establishments in this socioeconomic assessment area are involved in oil and gas extraction activities. Primary industries have been defined as those activities typically conducted by industry and their vendors in order to discover, produce, and bring crude oil and gas to processing locations. This includes exploration, drilling, mud service, other oil and gas field services, and water transportation.

The major secondary industry involves the wholesale trading of petroleum and petroleum products. Secondary industrial activities are those that provide general support for industry and their vendors, but not necessarily specialized to the petroleum industry, as well as those that further process or distribute oil and gas, such as vessel and platform fabrication, refining, and petrochemical processing (University of New Orleans, 1976).

SIC codes are used in Table III-16 to identify the location and size of related industry centers for the affected area. Refer to Section III.C.1.a. of this AEA for the SIC code definitions.

Table III-16 indicates that the primary industrial establishments of this socioeconomic assessment area occur in Hillsborough County. Approximately 84% of the secondary industrial establishments occur in Hillsborough and Pinellas Counties. Tertiary industries were not considered as part of this analysis. State industrial figures were included for comparison purposes.

Table III-16

Number of Establishments

Area	Primary	Secondary				
	SIC 13	SIC 29	SIC 3533	SIC 46	SIC 492	SIC 517
Florida	80	48	7	4	61	500
Hillsborough	4	7	0	0	4	49
Pinellas	0	2	0	0	3	11
Manatee	0	0	0	0	0	3
Sarasota	0	0	0	0	0	0
Charlotte	0	0	0	0	0	0
Lee	0	0	0	0	0	10
Collier	0	0	0	0	0	0
Monroe	0	0	0	0	0	0
TOTAL BY TYPE OF ESTABLISHMENT	4	9	0	0	7	73
TOTAL SECONDARY ESTABLISHMENTS				89		

Source: USDC, BC, 1982.

2. Land Use

a. Existing Community Services

A listing of the types of services and materials that typically support offshore exploratory drilling activity is presented in Table III-17. Site-specific information will be addressed in an SEA.

Table III-17

Services and Materials in Support of a Typical Exploratory Operation

Local	Specialized
Port Facilities - Rental with Material Handling Equipment - 24-Hour Dispatcher	Rig-Contract
Helicopters (possible)	Cargo Boats
Communications - Parts and Services - Radio, Telecopier, Telephone, etc.	Electrical Logging Services
Diving Service	Catering Service
Machine Shop	Casing Driving and Running Service
Welding Service	Perforating Service
Labor Contractor with Material Handling Equipment	Fishing Tools
Contract Oilfield or Specialty Trucking Firms with Hot Shot Service	Directional Drilling Service
Air Service Companies (Regular & Charter)	Coring Equipment and Services
Medical Services - at Marine and Helicopter Bases	Mud Engineering
Diesel Engine Repair Firms	Logging Service
Motor Freight	Completion Equipment and Related Service
Specialized Carriers including Bus, Courier Service, etc.	Tubular Inspection Firms - Full Service - Electronic Pressure Test, etc.
Weather Service	Wellhead Equipment
Small Fabricators	
Electrical Equipment Repair Shops	
Laundry Service	
Bilge Waste Disposal Service	
Garbage, Trash Dump Service	
Security Service	

Table III-17 (continued)

Services and Materials in Support of a Typical Exploratory Operation

Local	Specialized
Magnetic Particle and X-Ray Service	
Rental Car Agency	
Motels/Restaurants Near Onshore Support Base	
Propeller Repair Firm	
Tug Service	

Source: CSA, 1984.

b. Existing Transportation Systems and Facilities

Refer to Section III.C.3. for a discussion relative to water and air transportation systems. Site-specific information will be addressed in an SEA.

c. Supply and/or Existence of Coastal Resources

Site-specific information will be addressed in an SEA.

3. Onshore Support Facilities

Oil and gas industry infrastructure (including refineries, ports, shipyards, platform and pipeline fabrication yards, gas processing plants, and supply bases) is concentrated within certain counties of this socioeconomic assessment area.

Support centers are geographically situated adjacent to Tampa Bay in the Hillsborough, Pinellas and Manatee Counties, at Tampa-St. Petersburg, and Port Manatee. Onshore supply bases that may be used in support of exploratory operations in the AEA area are found at Port Manatee and Fort Myers, Florida (Refer to Figure III-6).

A typical supply base which supports offshore exploratory drilling operations is illustrated on Figure III-7. The base normally includes dock, office and warehouse space, a mobile crane, storage tanks, heliport, parking area, and road access.

A summary of selected previous oil and gas exploration and bases of operation proposed within this socioeconomic assessment area is presented in Table III-18.

Port Manatee, Florida, will likely be utilized by industry for future exploration activities in this AEA area. Fort Myers would possibly be considered a future onshore support site. Because of its distance from supply centers and associated expense involved, Key West would likely be used only as a helicopter and personnel staging area for operations proposed in the Pulley Ridge Area (Jones, 1985, personal communication).

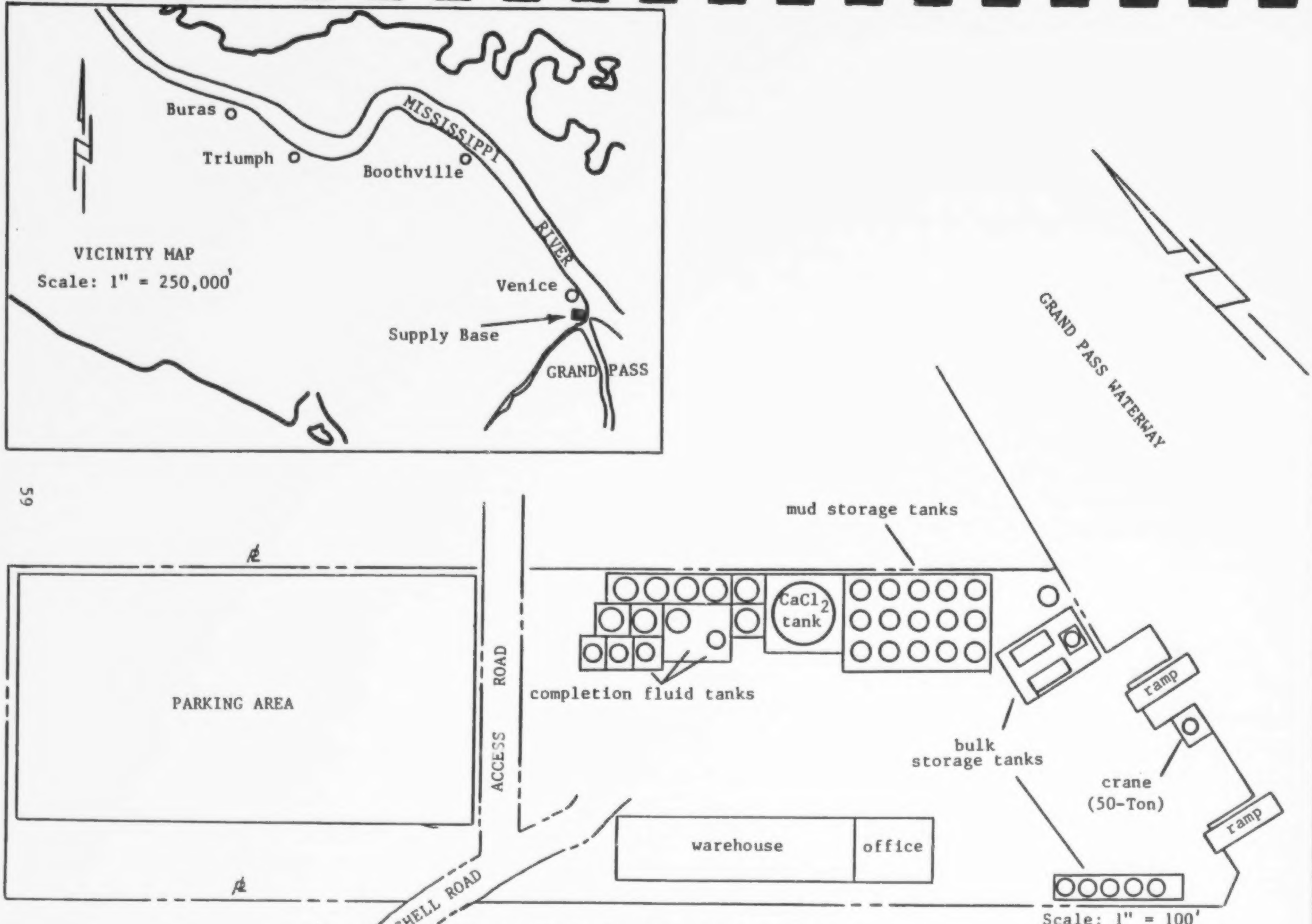

Buras
Triumph
Boothville
MISSISSIPPI RIVER
VICINITY MAP
Scale: 1" = 250,000'
Venice
Supply Base
GRAND PASS
GRAND PASS WATERWAY
mud storage tanks
CaCl2 tank
completion fluid tanks
PARKING AREA
ACCESS ROAD
bulk storage tanks
ramp
crane (50-Ton)
ramp
warehouse
office
SHELL ROAD
Scale: 1" = 100'

Figure III-7 Typical Onshore Support Base
Source: Phillips Petroleum Company, 1984.

Table III-18

Selected Previous Oil and Gas Exploration Proposals and Bases of Operation

Area	Block	Company	Activity (Lease OCS-G #)	Onshore Support Base
Charlotte Harbor	144, 145	Gulf Oil	10 exploratory wells, 3906, 3907	Port Manatee
Charlotte Harbor	188, 231	Ocean Production	2 exploratory wells, 3909, 3911	Port Manatee
Charlotte Harbor	265	Shell Offshore	1 exploratory well, 3912	Port Manatee
Charlotte Harbor	628	MOEPSI	3 exploratory wells, 3915	Port Manatee
Charlotte Harbor	672, 716	Tenneco Oil	10 exploratory wells, 3917, 3919	Port Manatee
Charlotte Harbor	715	Chevron U.S.A. Inc.	1 exploratory well, 3918	Port Manatee
The Elbow	652	MOEPSI	2 exploratory wells, 3342	Port Manatee
The Elbow	565, 566	MOEPSI	3 exploratory wells, 3343, 3344	Port Manatee
Vernon	610	Chevron U.S.A. Inc.	1 exploratory well, 3900	Port Manatee
Vernon	654	MOEPSI	4 exploratory wells, 3903	Port Manatee

Source: MMS, Environmental Operations Section Records.

Onshore facilities in support of offshore exploratory activity include marine vessel and aircraft (helicopter) operations. Ports exist at Mobile, Tampa, St. Petersburg, Port Manatee, Bradenton, Port Charlotte, and Port Boca Grande, Florida (Figure III-6). Tampa and Manatee, Florida are considered major seaports of southwest Florida (French and Parsons, 1983). Water transportation is essential to the oil and gas industry. Three major types of vessels--tugs, supply, and crew--are used in support of offshore oil and gas development. Tugs account for more than 50% of the total numbers of vessels in operation while supply and crew boats each account for approximately 15%. The remaining 20% are classified as either dual or specialized purposes (University of New Orleans, 1976). Helicopters are used to transport rig crews to and from offshore facilities, transport emergency parts and service personnel, perform pipeline patrol and oil spill control tasks, and provide emergency service to area hospitals. Commercial airports exist in Hillsborough, Lee, Monroe, and Sarasota Counties (French and Parsons, 1983). Marine vessels and helicopters normally originate from the onshore support base location. Refer to Section IV.C.3. of this AEA for additional discussion of facility requirements and siting considerations.

Site-specific information applicable to onshore support facilities will be addressed in an SEA.

4. Public Opinion

A public hearing was held in Panama City, Florida, on September 13, 1984, regarding the Draft Regional EIS covering the leasing of acreage within the affected area. Testimony heard at this hearing by Mr. Carlton Jackson, representing the Florida Petroleum Council, noted that according to a recent public opinion survey by Hamilton and Staff from Chevy Chase, Maryland, 7 out of 10 people in Florida support the concept of leasing lands offshore for oil and gas. The strongest support came from West Florida where 79% support the idea, 19% are opposed, and 2% have no opinion on the subject (USDI, MMS, 1984b). Letters received from the State of Florida were also taken into consideration prior to the lease offering. The State has expressed agreement with the goal of obtaining new sources of oil and gas in a manner expeditious and consistent with concern for the environment (USDI, MMS, 1984a).

5. Navigation

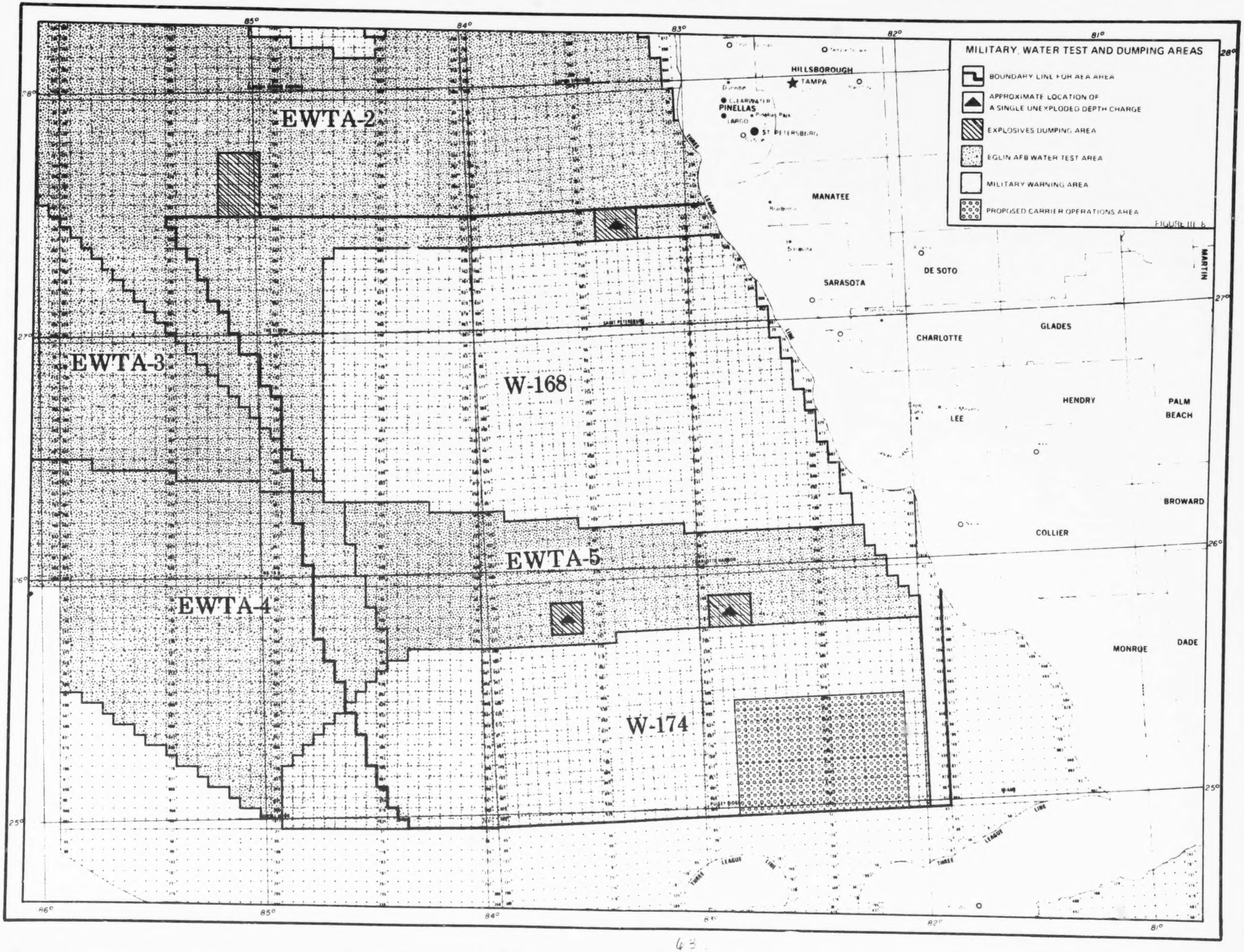
A fairway connects the offshore (north of the AEA area) from approximately the 200m (656 ft) water depth with the Tampa Bay area. The Intracoastal Waterway transects the coastal counties and parallels much of the shore between the barrier islands and those coastal counties of Florida under consideration. The Intracoastal Waterway continues in the offshore AEA area at Pinellas County, where it again traverses between the coastal counties and the barrier islands. Cargo and crew boats supporting exploratory activity in the AEA area will utilize this existing transportation system (USDI, MMS, 1984b, Visual Nos. 7 and 11).

6. Military Warning/Use Areas

This area of the northeastern Gulf is used extensively by the Department of Defense. Those areas utilized by the military within the AEA area are shown in Figure III-8. Military operations within these areas include carrier maneuvers, missile testing, rocket firing, pilot training, air-to-air gunnery, minesweeping operations, submarine operations, air combat maneuvers, aerobatic training, and instrument training. Additionally, one area is a designated explosive dumping area. In the area shown in Figure III-8, dumping consisted of old ordnance and unexploded shells (duds) and depth charges. The explosive dumping area has not had any dumping activity since 1969-1970. Also, the U.S. Air Force has released an indeterminable amount of unexploded ordnance in these areas as a result of testing and training (USDI, MMS, 1984b).

7. Commercial Fishing

The Gulf of Mexico is the single most important area for fisheries production in the United States with total annual landings averaging about two billion pounds, valued at over $600 million dockside (USDI, MMS, 1984b). This discussion is limited to commercial fishing in the west and southwest Florida area of the AEA's impact region.



EWTA-2
EWTA-3
EWTA-4
EWTA-5
W-168
W-174
HILLSBOROUGH
TAMPA
CLEARWATER
PINELLAS
LARGO
Pinellas Park
ST. PETERSBURG
MANATEE
SARASOTA
DE SOTO
CHARLOTTE
GLADES
MARTIN
LEE
HENDRY
PALM BEACH
BROWARD
COLLIER
MONROE
DADE
THREE LEAGUE LINE
28°
27°
26°
25°
86°
85°
84°
83°
82°
81°
BOUNDARY LINE FOR AEA AREA
APPROXIMATE LOCATION OF A SINGLE UNEXPLODED DEPTH CHARGE
EXPLOSIVES DUMPING AREA
EGLIN AFB WATER TEST AREA
MILITARY WARNING AREA
PROPOSED CARRIER OPERATIONS AREA

MILITARY, WATER TEST AND DUMPING AREAS

FIGURE III 6

West and southwest Florida (Hillsborough, Pinellas, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties) have some of the most abundant, varied, and highly valued commercial marine fish and shellfish species. Table III-19 gives the quantity and value of finfish and shellfish landed in these counties. The total fish and shellfish landings for Florida's west and southwest coast (Hillsborough to Monroe County) in 1980 were 68 million pounds, valued at $65.3 million.

Three large estuaries dominate west and southwest Florida. They are Tampa Bay, Charlotte Harbor, and Key West/Florida Bay). The offshore waters of these large estuarine nursery areas support extensive commercial fisheries. The locations of about 40 sport and commercial fishing concentrations have been identified by Moe (1963).

Nearly all species significantly contributing to the Gulf's commercial catches are estuarine dependent. With the exception of such species as the oyster and spotted sea trout, most leave the estuaries as juveniles or subadults and spawn at sea after becoming reproductive adults. The eggs of the majority of these species hatch in the waters of the open Gulf, and the developing larvae become part of the offshore planktonic community. Under the influence of tides, currents, and winds, the young eventually arrive at the estuarine nursery grounds where they feed, grow, and mature prior to migrating out to sea to repeat the spawning process (USDI, MMS, 1983a).

Table III-19

Fish and Shellfish: Quantity and Value of Landings in
Specified Counties of West and Southwest Florida, 1980

	Landings (Pounds)			
State/County	Total	Fish	Shellfish*	Total Value (Dollars)
Hillsborough	4,689,000	3,307,000	1,382,000	3,273,000
Pinellas	9,308,000	7,101,000	2,207,000	7,913,000
Manatee	4,590,000	4,463,000	127,000	1,665,000
Sarasota	256,000	232,000	24,000	79,000
Charlotte	3,153,000	2,662,000	491,000	1,055,000
Lee	16,291,000	11,592,000	4,699,000	13,884,000
Collier	5,965,000	4,423,000	1,542,000	3,730,000
Monroe	23,304,000	5,565,000	17,739,000	33,746,000
TOTAL	67,556,000	39,345,000	28,211,000	65,345,000

Source: Terhune, et al., 1983, p. 308.

*Shellfish includes shrimp.

Important invertebrates landed at Florida's west and southwest coast ports include the spiny lobster, blue crab, stone crab, and one species of shrimp (pink). Most of the spiny lobster landings are from Monroe County; however, spiny lobster harvest is prohibited in parts of Florida Bay within the

Everglades National Park. This area serves as an important nursery ground for lobster stocks that will enter the fishery. The majority of Florida's west coast blue crab landings are produced in the estuarine or nearshore coastal waters of north and northwest Florida; however, considerable fisheries also exist in the areas of Pinellas to Lee Counties, and Collier to Dade Counties. The principal fishery for stone crabs is off Collier County and in northern Florida Bay. The Tortugas Grounds west of Florida Bay contributes about 48% of the west coast Florida pink shrimp catch; Florida Bay shallows are vital nursery grounds for the Tortugas shrimp fishery. The Sanibel Grounds off Charlotte and Lee Counties and Tampa Bay produce about 28% of the pink shrimp catch. The Charlotte Harbor-Pine Island Sound and Tampa Bay estuarine systems support nursery stock for these fisheries.

Coastal fishes of economic importance to western Florida include sheepshead, red drum, black drum, sea trout (two species), menhaden (two species), snook, whiting (three species), spot, croaker, pompano, permit, bonefish, and mullet (four species). Most of these species occur along the entire Florida Gulf coast. However, fishes such as menhaden, spot, and croaker are temperate forms and are found mainly in the northern Gulf; others, such as snook and bonefish, are tropical and are found mainly in the southern Gulf. Four species of snappers (red, mangrove, lane and yellowtail) occur on the continental shelf wherever hard bottoms with rocks, holes, or crevices are available.

There are commercially important pelagic fish which make seasonal movements up and/or down the west Florida coast. In spring, king and spanish mackerels leave their wintering areas in south Florida and move northward along the continental shelf to their spawning and summering areas in the northern Gulf (Terhune, et al., 1983).

8. Recreation/Tourism

Resources/Tourism

Florida is one of the most highly developed recreational areas in the United States. The Florida coastline adjacent to the AEA area offers a variety of recreational resources and activities, particularly in connection with marine fishing and beach-related activities. Approximately 249 km (154.9 mi) of intensively used recreational beaches extend along Florida's southwest coast from Pasco to Monroe County. The recreational beaches are composed of white quartz sand and are located from Anclote Key (off Tarpon Springs) south to Marco Island (Palik and Lewis, 1983). Extensive residential and recreational development has occurred along these resources. Therefore, most of the recreational activity in this coastal area is beach-oriented. Numerous National and State parks and recreation areas are available for recreational use in the AEA coastal area. A list of these parks and recreation areas and their attendance for calendar year 1981 or 1982 is given in Table III-20.

Tourism has long been recognized as an important element of the Florida economy. According to the 1982 Florida Visitor Study, a record 39.3 million visitors traveled to Florida in that year, spending more than $21 billion at a variety of major attractions (Florida Division of Tourism, 1982). As indicated in Table III-20, the State parks and recreation areas in the AEA coastal area draw a large number of these visitors yearly. Statewide, Dade, Pinellas, Hillsborough, Sarasota, Monroe, and Manatee Counties ranked in the top ten counties chosen as favored destination points by air visitors in 1982 with Dade County being the first choice destination. About 63% of the Florida auto visitors cited the beaches as a primary interest according to the 1982 study, compared to 31.8% of the air visitors during this time (Florida Division of Tourism, 1982). Refer to the FREIS (USDI, MMS, 1983a) for additional information on the recreational resources available in the AEA area.

Table III-20

Attendance at National (1981) and State (1982) Parks and Recreation Areas in Counties Adjacent to AEA Area

Recreation Area	County	1981	1982
Bahia Honda	Monroe		298,651
Barnacle, The	Dade		10,759
Bickle Mound, Madira	Manatee		3,045
Biscayne National Park	Dade	305,500	
Caladesi Island	Pinellas		137,046
Cape Florida	Dade		704,647
Chekika	Dade		49,786
DeSoto National Memorial	Dade	165,400	
Everglades National Park	Dade	564,700	
Ft. Jefferson National Monument	Monroe	10,100	
Ft. Taylor	Monroe		1,351
Gamble Plantation	Manatee		28,328
Hillsborough River	Hillsborough		234,728
Honeymoon Island	Pinellas		2,089,989
Indian Key	Monroe		4,108
Koreshan	Lee		41,313
Lake Manatee	Manatee		40,614
Lignumvitae Key	Monroe		4,852
Long Key	Monroe		105,462
Looe Key	Monroe		5,184
Myakka River	Manatee, Sarasota		219,136
Pennekamp, John Coral Reef	Monroe		508,205
Rookery Bay	Collier		14,420
Scherer, Oscar	Sarasota		100,287
Weeden Island	Pinellas		15,531
Wiggins Pass	Collier		454,351
Ybor City	Hillsborough		4,920

Source: Terhune, et al., 1983.

Boating - Along the Florida coast, boating is a popular weekend and seasonal sport. Access to the open Gulf for recreational purposes (saltwater fishing, SCUBA diving) requires a boat; therefore, some portion of coastal boaters venture into the open Gulf in their private vessels. The number of private boat owners who use their craft recreationally in the Gulf is not precisely known; however, former studies and estimates by U.S. Coast Guard and others indicate that approximately 5%-10% of the registered motor boats in the Gulf coastal States venture out into the Gulf (USDI, MMS, 1983a). Approximately 97 public boat ramps are available for use in southwest Florida. Most of these boat ramps (59%) are centered in the high density urban coastal counties of Pinellas, Sarasota and Lee. Approximately 436 marinas are concentrated in southwest Florida (Palik and Lewis, 1983). Table III-21 gives the numbers of registered boats for the counties adjacent to the AEA area.

Table III-21

Pleasure Boats Registered in AEA Coastal Area

Fiscal Year 1981-82

County	Number
Pinellas	30,115
Hillsborough	29,176
Manatee	10,048
Sarasota	13,051
Charlotte	7,735
Lee	18,084
Collier	8,857
Monroe	10,094
Dade	38,026
TOTAL	165,186

Source: Terhune, et al., 1983.

Sport Fishing - Marine recreational fishing is an important and very popular activity for residents and tourists in the AEA coastal region. The demand for saltwater fishing in the coastal zone and offshore is projected to grow along with population and tourist growth. There are 25 major public fishing piers located in southwest Florida (Palik and Lewis, 1983). As an outgrowth of the significant demand for saltwater fishing, especially from tourists, a large charter and head boat fishery has developed over the years (USDI, MMS, 1983a). Charter boats are boats that can be rented (chartered) for a specified period of time. Head boats are large party boats that go fishing offshore in the Gulf of Mexico or Florida Straits for a specified period of time (usually half-day, one day, or two days) and charge a dollar fee per person (Palik and Lewis, 1983). Table III-22 shows the numbers available and the base locations for the major charter and head boats in the AEA area. King mackerel, reef fishes (snapper and grouper), redfish, and flounder are the most sought after by Florida's offshore charter boats in the winter and billfish in the summer and fall. Grouper is the leading species fished by head boats in Florida. The Gulf of Mexico Fishery Management Council, for all Gulf States, estimated in 1981, that groupers, jacks, porgies, and snappers made up 93% of the number of fish caught and 99% of the weight (French and Parsons, 1983).

Natural and artificial reefs are the focus of most offshore recreational fishing. Florida's coastal waters contain more artificial reefs than any other State. Scientific development and deployment of artificial reefs has been a slow process with little research and scanty funding. Without considerable volunteer effort to secure materials and free labor, many of the present artificial reefs off southwest Florida would not exist. The largest group of organizations which have put together an artificial reef program is found in Pinellas County. The cities of Clearwater, Madeira Beach, St. Petersburg, St. Petersburg Beach, and Treasure Island, and the Pinellas County Board of

Commissioners have built 20 reefs, of which 10 are presently being maintained by Pinellas County Mosquito Control. Its annual budget supports a small crew, barge rental, operating expenses, and equipment (Palik and Lewis, 1983).

Virtually all artificial reefs in Florida are composed of either ships, automobiles, tires, or concrete. New, prefabricated artificial reefs are being introduced in Florida by the Japanese (off Ft. Lauderdale, Panama City, and Jacksonville) under contract with the National Marine Fisheries Service (Palik and Lewis, 1983).

The artificial reefs program of the State of Florida is administered by the Bureau of Marine Science and Technology under Section 370.013 of the Florida Statutes. Approximately $110,000 in grants was awarded in 1979 and 1980, which were the first two years of the newly adopted program. The principle types of fish that inhabit the artificial reefs located in the southwest Florida study area coastal waters are grouper, snapper, Spanish mackerel, king mackerel, and amberjacks (Palik and Lewis, 1983) Visual No. 4-II of the EIS for Sales 94, 98, and 102 lists those artificial reefs along the coastal area adjacent to the AEA area (USDI, MMS, 1984b).

Table III-22

Major Charter and Headboat Ports in the AEA Coastal Area

Port Vicinity	Number of Charterboats	Number of Headboats
Clearwater/Dunedin/ Tarpon Springs	19	8
Saint Petersburg/ Madeira Beach	3	3
Brandenton/Cortez	2	3
Sarasota/Venice/Englewood	14	0
Boca Grande/Captiva/Bokeelia/ Matlacha	25	1
Ft. Myers/Cape Coral/Bonita Springs	25	3
Naples	17	3
Marco Island/Marco/Goodland	30	0
Everglades City/Chokoloskee	19	0
Flamingo	1	0
Florida Keys	120	24
Total	275	45

Source: Palik and Lewis, 1983.

9. Cultural Resources

Cultural resources are any objects or features which are man-made or modified by human activity. Significant cultural resources are either historic or prehistoric and, as defined by 36 CFR 60.6, generally include properties greater than 50 years old which are associated with events that have made a significant contribution to the broad patterns of our history; are associated with the lives of persons significant in the past; embody the distinctive characteristics of a type, period, or methods of construction; represent the work of a master; possess high artistic values; represent a significant and distinguishable entity whose components may lack individual distinction; or have yielded, or may be likely to yield, information important in prehistory or history.

The 1977 cultural resource baseline study by Coastal Environments, Inc. (CEI), established probability zones for the potential occurrence of historic shipwrecks and prehistoric sites in the northern Gulf of Mexico. The prehistoric cultural resources high probability line and the historic cultural resources high probability line, as depicted on Visual No. 11 of the FEIS for Sales 94, 98, and 102 (USDI, MMS, 1984b), are primarily derived from the high probability zones identified in the CEI study. These zones are a reflection of "high probability" limits which were developed as a synthesis of the known archaeological record for the entire Gulf Coast, an interpretation of possible prehistoric settlement patterns based on the geomorphology of the Outer Continental Shelf, and data on the occurrence of known historic shipwrecks in the northern Gulf of Mexico from 1500 A.D. through 1945 A.D. (CEI, 1977).

One method of meeting the Department of the Interior cultural resource legal and regulatory compliance responsibilities on the OCS, where the resource base is largely unlocated, is to require postsale remote sensing surveys for the detection of such resources prior to lease exploration. Based on the cultural resource probability zones, lease stipulations are invoked to require high-resolution remote sensing surveys and cultural resource reports under Notice to Lessees and Operators No. 75-3 (Revision No. 1).

High-resolution remote sensing surveys to determine the potential existence of cultural resources that may be affected by future lease operations have been conducted for only two leases (Table III-23). Potential cultural resources (sinkholes having potential as prehistoric sites) were detected on Pulley Ridge Blocks 694 and 695, Leases OCS-G 6506 and 6507.

The specific cultural resources located within the area of a proposed activity will be discussed in an SEA.

Historic - Based on the information provided by the cultural resources baseline study, supplemented by information from the quarterly Defense Mapping Agency printout of nonsubmarine contacts, MMS records show two located shipwrecks within this area of concern. Table III-24 lists the shipwrecks by OCS lease areas within which the wreck could possibly lie (USDOD, DMA, 1982).

It should be emphasized that hundreds of other ships from all historic periods are known to have gone done somewhere in the eastern Gulf; however, information on the locations of these reported wrecks is not sufficient to allow mapping.

Visual No. 11 of the FEIS for Sales 94, 98, and 102 (USDI, MMS, 1984b) lists the historic and prehistoric sites on the National Register of Historic Places which are found in the affected coastal counties adjacent to the AEA area. These sites have a potential for being disturbed by associated onshore oil and gas infrastructure which may be located within these counties.

Prehistoric - Of the geographic features listed in Table III-37 of the FREIS (USDI, MMS, 1983a) which have a high probability for associated prehistoric sites, relict barrier islands with back barrier bays and lagoons, karst topography and possibly coastal dune lakes predominate in the eastern Gulf (CEI, 1977). Across much of the eastern Gulf the shelf geomorphology is well-preserved. In this portion of the Eastern Planning Area, wave energy is relatively high. In general, Holocene sediments range from a thin veneer to totally absent, and consist primarily of carbonate sands.

There would be a high probability for the occurrence of prehistoric sites in association with the relict geomorphology mentioned above. Preservation of site materials would be very good in the karst areas and in the areas of low wave energy. Recovery of site information would be facilitated by the generally thin sequence of Holocene sediments across this area.

Table III-23

Cultural Resource Reports
South Central Section of Eastern Planning Area

Lease Area/Block	Lease No.	Archaeologist	Potential Cultural Resources Identified
Pulley Ridge 694 and 695	6506, 6507	William Spencer	Sinkholes
Pulley Ridge 1001	6540	Laura Landry	None
Pulley Ridge 999	6538	Laura Landry	None
Pulley Ridge 994 and 995	6536, 6537	Laura Landry	None

Table III-24

Shipwrecks with Known Locations in the AEA Area

Name of Vessel	Type	Date			Lease Area
		Built	Sunk	Recorded	
Antonia Ensen	Cargo		1943	1945	St. Petersburg
E. L. Cothingham	Schooner	1875	1906	1906	Vernon, The Elbow

Source: USDOD, DMA, 1982.

10. Other Commercial Uses

There are no other commercial uses in the area to be affected by oil and gas exploration activities.

11. Other Mineral Uses

Other minerals which may have economic value on the OCS are sulfur, heavy minerals, shell and sand deposits, and phosphorites. Deposits of phosphate rock are reported on the west Florida platform in the area of the AEA. Their extent, quantity, and quality are not fully known. Additional information concerning other minerals on the OCS of the eastern GOM may be found in Section I.B.6.d of the FREIS (USDI, MMS, 1983a). Holmes and Doyle (1983) have also discussed sediment composition in the eastern Gulf area.

12. Pipelines and Cables

At the present time, there are no existing pipelines or cables on the OCS of the eastern Gulf of Mexico in the area of this AEA.

13. Ocean Dumping

All ocean dumping is regulated by the Marine Protection, Research, and Sanctuaries Act of 1972, 33 U.S.C. 1401 et seq. These regulations require a USEPA permit for all ocean dumping of industrial wastes and municipal sludge materials. Ocean dumping of sewage sludge is prohibited. The designated ocean areas where wastes may be disposed are listed in 40 CFR 228. Further, USEPA publishes an annual report entitled Ocean Dumping in the United States.

This report includes information on permit holders, type of waste approved for disposal under the permit, and yearly waste volumes disposed.

USEPA has designated one large deepwater disposal area in the western Gulf of Mexico. There are no present or expected ocean dumping grounds designated in the eastern Gulf. A U.S. Army Corps of Engineers (COE) permit is required for ocean disposal of dredged material.

U.S. Department of Defense military dumping areas are located in the eastern Gulf AEA area. Refer to Section III.C.6 of this AEA for a discussion of these dumping sites.

IV. ENVIRONMENTAL CONSEQUENCES

A. OIL SPILLS

1. Oil Spill Accidents

Accidental discharge of oil can occur during exploration activity on the OCS. However, as indicated by Table IV-1, oil production operations account for the vast majority (90%) of all oil spills from OCS oil-related activities. Drilling operations account for less than 6% of oil spillage into Gulf waters and only 9% of the total accidents occurring between 1967 and 1980 (USDI, MMS, 1983a).

Table IV-1

Number of Spills (1967-1980) for Different Types of Operations

Type of Operation	Number of Spills for the Period 1967-1980
Drilling (Mobile unit)	38
Drilling (Fixed unit)	40
Completion, Recompletion, or Workover	36
Production	1,190
Abandonment	1
Other	18
Unknown	2
TOTAL	1,325

Source: USDI, MMS, 1983a.

The total number and volume of oil spillage from mobile drilling units in the Gulf of Mexico OCS from December 1974 to May 1984 is given in Table IV-2.

Table IV-2

Total Number and Volume of Oil Spills
Mobile Drilling Units
Gulf of Mexico Outer Continental Shelf
December 1974-May 1984

Spill Size	Number of Spills	Volume of Spills (bbls)
Less than 50 bbls	42	370½
Greater than 50 bbls, less than 1,000 bbls	6	903
More than 1,000 bbls	1	1,500
Total	49	2,773½

Note: Volumes for spills less than one barrel are assumed to be spills ½ barrel each.

Note: Statistics for spills less than 50 barrels were not kept before 1974 because of less stringent accident investigation requirements; therefore, comparisons of volume and number of spills are done only on statistics collected after 1974.

Source: USDI, MMS, 1984c.

The major causes of rig mishaps worldwide are blowouts, followed by on-location damage by hurricanes and rough seas, and towing in fair weather. Including blowouts, more than 50% of oil spillage events result from human, engineering, or equipment errors (USDI, MMS, 1983a). Information from the northern Gulf for the period of 1964 to May 1984, shows a total of 31 blowouts for mobile drilling units, with only four blowouts resulting in the loss of oil and/or condensate. The total spillage from these four incidents was approximatly 2,500 barrels. Five blowouts contributed either minimum amounts or unknown amounts (USDI, MMS, 1984c). Most blowout spillage results from producing oil wells, not from oil wells being drilled (USDI, MMS, 1983a).

As indicated in Table IV-1, spills greater than 1,000 barrels accounted for approximately 54% of the total volume of oil spilled from federally funded oil activities in the Gulf of Mexico OCS from 1974 to May 1984. Spills less than 1,000 barrels accounted for approximately 46% of the total oil spillage. Spills less than 50 barrels account for 13% of the oil discharged accidentally from mobile drilling units into Gulf waters (USDI, MMS, 1984c). Based on volume alone, smaller spills do not play as significant a role in potentially impacting the Gulf environment as the large spills. However, what may be important in a discussion of chronic long term effects is not the volume spilled but the frequency of oil spillage less than 1,000 barrels. Although the effect to the marine environment of these smaller spills is unknown, the spills may represent a continuous and persistent stress to the exposed area. Low-level chronic oil pollution may have more long term harmful consequences to the ecosystem than the isolated large spills (i.e., spills greater than 1,000 barrels)(USDI, MMS, 1983a).

2. Vulnerability of Coastal Land Segments to Oil Spills

One of the most important factors which influences the amount of damage done by an oil spill is the geographic location of the spill. Using representations of winds and currents, hypothetical oil spill trajectories were simulated as a part of the Oil Spill Risk Analysis (Labelle, 1982) for each of the 143 spill areas making up the Eastern, Central, and Western Planning Areas. Those spill areas contained in the AEA area (spill areas: 100-102, 109-114, 121-126, 133-138, 143-146, and 149-151) are depicted on Figure IV-1. The results of these trajectory simulations were used to calculate the probabilities that an oil spill starting at a particular location will contact a certain land segment within 3, 10, or 30 days. For the purposes of the Oil Spill Risk Analysis, the entire Gulf coastal area was divided into land segments by county/parish. Land segment designations comprising the AEA coastal area are listed in Table IV-3 and depicted on Figure IV-1.

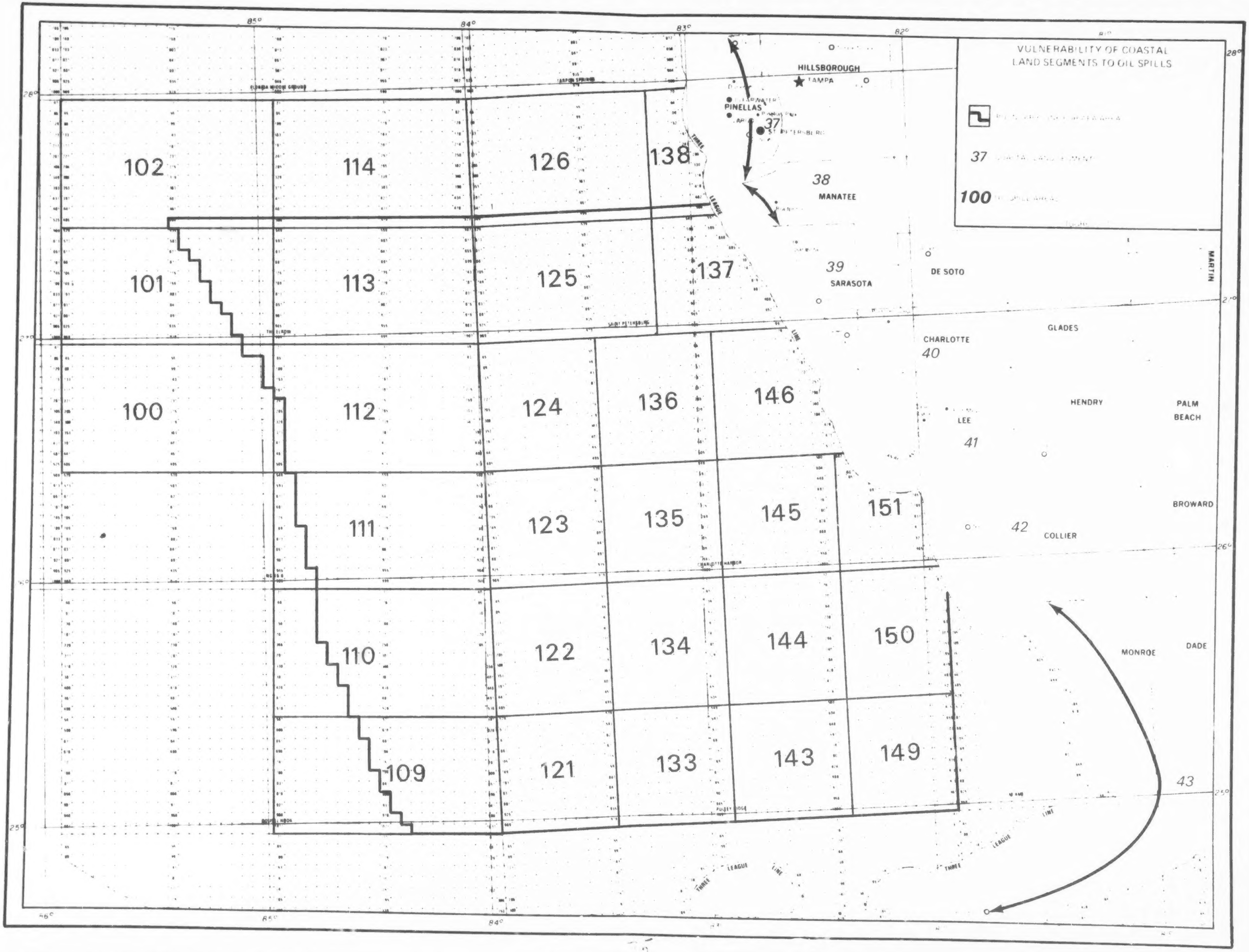

VULNERABILITY OF COASTAL LAND SEGMENTS TO OIL SPILLS
37
100
85°
84°
83°
82°
81°
86°
28°
27°
26°
25°
HILLSBOROUGH
TAMPA
PINELLAS
CLEARWATER
ST PETERSBURG
37
38
MANATEE
39
SARASOTA
DE SOTO
MARTIN
CHARLOTTE
40
GLADES
HENDRY
PALM BEACH
LEE
41
BROWARD
42
COLLIER
MONROE
DADE
43
THREE LEAGUE LINE
TARPON SPRINGS
SAINT PETERSBURG
CHARLOTTE HARBOR
PULLEY RIDGE
102
114
126
138
101
113
125
137
100
112
124
136
146
111
123
135
145
151
110
122
134
144
150
109
121
133
143
149

Table IV-3

Counties Comprising Land Segments Adjacent to the AEA Area

Land Segment	County Name
37	Pinellas, Hillsborough
38	Manatee
39	Sarasota
40	Charlotte
41	Lee
42	Collier
43	Monroe, Dade

Source: Labelle, 1982.

A summary of the trajectory analysis (for 10 days) representing all potential oil spill sites throughout the AEA area is presented in Table IV-4. Table IV-4 is based on the assumption that an oil spill has occurred in one of the hypothetical spill locations in the AEA area and gives the percent chance that an oil spill starting in one of the indicated spill locations will contact a certain land segment within ten days. Ten days was chosen as the most likely oil slick sea surface residence time, because after ten days the oil properties have changed extensively (Refer to Section IV.A.3). As indicated in Table IV-4, land segment 41, Lee County, Florida, is the most vulnerable to oil spills occurring in the AEA offshore oil spill areas.

3. Assumptions About the Characteristics and Fates of an Accidental Oil Discharge

It is assumed that oil spills occurring in the AEA area would have characteristics similar to Louisiana crude (a light, very low asphaltene oil), although variations in composition can be expected from oils produced from different formations or fields within each region or between areas. Spilled Louisiana crude disperses and degrades rapidly under the influences of the Gulf's warm climatic conditions and the properties of the oil. Ten days is chosen as the most likely oil slick sea surface residence time. After ten days, the oil properties have changed extensively. The original volume has decreased greatly; 47-67% of the original slick volume is lost from the water's surface (Table IV-5). The floating oil is largely devoid of its volatile (acutely toxic) components and is gradually forming emulsions. By four days, enlargement of the slick is completed, and actual spreading is subordinate to fragmentation and dispersion. Dominant processes affecting spilled oil during ten days or less include spreading, evaporation, dissolution, and dispersion. Dominant processes altering a slick's characteristics after ten days include emulsion formation, sedimentation, auto- and photo- oxidation, biological processes, and tar residue formation (USDI, MMS, 1984b). Table IV-5 gives the time scale (in days) for the dominant effects of the weathering processes. Percent volume loss from the slick from the sea surface after 10 to 30 days is indicated in Table IV-6.

Table IV-4

Trajectory Simulation Summary for the AEA Area[1]

Land Segment[2]	Hypothetical Spill Locations																										
	E* 100	E 101	E 102	E 109	E 110	E 111	E 112	E 113	E 114	E 122	E 123	E 124	E 125	E 126	E 133	E 134	E 135	E 136	E 137	E 138	E 143	E 144	E 145	E 146	E 149	E 150	E 151
37	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
38	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	n	n	n	2	n	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	2	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	9
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

*Eastern Planning Area

[1] Percent chance that an oil spill starting at a particular location will contact a certain land segment within 10 days.

[2] Coastal land segments beyond the AEA coastal area are not included in this table.

n = less than 0.5 percent.

Source: Labelle, 1984.

Table IV-5

Time Scale (in days) for Weathering Processes[1]

Process	Time Scale (in days)
Evaporation	1-10
Dissolution	1-10
Dispersion	1-30
Auto-Oxidation	3-365
Biodegradation	5-720
Sinking and Sedimentation	10-365
Tar Residue	10-365

[1] Assumption is that spill does not contact land.

Source: USDI, MMS, 1984b.

Table IV-6

Percent Volume Loss from the Slick from the Sea Surface after 10 or 30 Days[1]

Process	% Loss of Original Slick Volume (10 days)	% Loss of Original Slick Volume (30 days)
Evaporation	45%*-25%	45%*-25%
Dissolution	less than 1%	1%*-5%
Dispersion	10%	included in sinking and sedimentation rate
Auto-oxidation	less than 1%	5%
Biodegradation	1%	included in sinking and sedimentation rate
Sinking and Sedimentation	1%	34%*-20%
Tar Residue	less than 1%	1%*-30%
Offshore Skimming and Recovery Cleanup Operations	10%	15%
Total Volume Loss from Water Surface	67%*-47%	100%

[1] Assumption is that spill does not contact land.

* Ranges given provide an overview of crude oil fate in general. The first number (with an asterisk) represents the most likely percent loss of Louisiana crude due to that process.

Source: USDI, MMS, 1984b.

When initially spilled, most crude oils float. However, some of the oil is dispersed and retained in the water column. The mechanisms which result in oil being retained in the water column include dissolution, dispersion, sinking, and sedimentation (Table IV-6) (USDI, MMS, 1984b).

About 1-5% of the volume of the surface slick is predicted to occur in the water column in the vicinity of the spill. Some of this oil will reach bottom sediments. The relative amount of oil which resides in the water column is a function of a number of factors, including the chemical and physical nature of the oil, the point of release (surface versus subsurface) and the hydrographic conditions affecting the slick formed, particularly sea surface turbulence. The location of subsurface oil is governed by the density stratification of the water column. The submerged oil exists in association with strong water temperature and salinity gradients (USDI, MMS, 1984b).

The impact of a blowout involving oil would include effects such as those described for surface oil spills, although a blowout in which oil is vented from the seafloor could generally be more hazardous to biota than a surface spill due to the higher rate in which soluble fractions would enter seawater as the oil floats to the surface (USDI, MMS, 1984b).

One such blowout, IXTOC-I, was studied in great detail. Occurring in approximately 48m (157 ft) of water 80km (50 mi) northwest of Cuidad del Carmen, Mexico, on June 3, 1979, IXTOC-I resulted in an estimated rate of release of oil for the first four months ranging from 10,000 to 30,000 barrels/day. The concentrations of oil in the water column measured around the site of the IXTOC-I blowout ranged from values of less than 5 ug/L at a distance of 80km (50 mi) from the blowout to peak values of 10,600 ug/L within a few hundred meters of the wellhead. Although surface oil was found 80km (50 mi) or more to the northeast of the well, elevated concentrations of oil in the water column were limited to within 40km (25 mi). It is therefore evident that somewhat dissimilar processes were controlling the transport of surface and subsurface oil. The subsurface plume of oil droplets suspended in the top 20m (66 ft) of the water column extended 25km (16 mi) to the northeast of the blowout and appeared to move in response to ocean currents rather than the wind (Fiest and Boehm, 1980). The absence of high concentrations of oil at depths below 20m (66 ft) in the plume may have been the result of three processes. First, the plume of oil and water streaming from the blowout in the seabed had a net upward velocity that could have caused it to rise quickly to the surface where it spread horizontally in response to prevailing currents. Second, the positive buoyancy of the oil droplets within the plume may have caused them to move vertically within the plume and remain close to the surface. Third, droplets of oil could have been generated by turbulence at the air/oil interface and subsequently driven down into the water column. The slightly positive buoyancy of the droplets would have retained them near the surface. Although there was no evidence to favor one hypothesis over another, Fiest and Boehm (1980) concluded that the formation of oil droplets acts to concentrate the oil close to the surface (USDI, MMS, 1984b).

Based on evidence determined from the IXTOC-I blowout, it is estimated that approximately 1% of the total oil spilled would be present in the subsurface [2-20m (7-66 ft)] zone within a 25km (16 mi) distance from a blowout source. Of this material, about 90% would be particulate and about 10% dissolved and/or colloidal in nature (Boehm and Fiest, 1980a). Concentrations of some of the more toxic components appeared in the water column in sizeable amounts. The researchers reported that these values fell well within the range of observable effects on marine organisms (USDI, MMS, 1984b). Minor quantities of the total spilled oil 0.5-3% may reside in surface sediment layers within

50km (31 mi) of a blowout site. Concentrations of oil in the sediments after the IXTOC-I blowout were detected as high as 100ppm but probably would be much higher closer to the well and in the top layer [(0-10mm (0-0.4 in)] of sediment (Boehm and Fiest, 1980b).

4. Effects of Oil Spills on the Environment

Coastal Habitats - The effects of crude oil spills on coastal ecosystems have received considerable attention and have been discussed in detail in the FREIS, Volume 1, Section IV.B.3d. and IV.B.4. Important variables discussed include the amount and toxicity of the crude, the degree of weathering the crude has undergone prior to contacting a coastal ecosystem, the ecosystem type or types contaminated (i.e., marsh, beach, estuary, etc.), the climate and weather at the spill site, the water depth and suspended sediment load, the cleanup method attempted, and previous exposure to oil spills. The above variables will determine the degree of damage and the recovery time for a particular coastal spill.

Oil reaching estuaries or marshes may have its most serious biological effects there. Estuarine organisms can be exposed to long periods of contamination because the vegetation traps and holds the contaminants. Since many of these organisms are living at or near the limit of their tolerance range, mortality could be high. Spartina spp. of the Gulf coastal salt marshes have been shown to withstand moderate single doses of hydrocarbons, but continuous applications prove lethal because the oil kills the roots and rhizomes. All marsh plants species would probably be most affected by a spill during the growing season when the oil could influence flowering, vegetative reproduction, and seed development. In all coastal environments, oil spilled from onshore transportation or treatment activities may contaminate soil, vegetation, or shoreline. These spills may enter storm sewers and finally reach coastal water.

The levels of impacts to coastal ecosystems depend on the magnitude of an oil spill and on the frequency of spills contacting these habitats. If a spill does contact coastal wetlands, losses of marsh vegetation, mangroves, and other biologically productive habitats will be severe and may be relatively long-term.

Oil spills that occur in coastal wetlands can cause severe and often long-term adverse impacts. Marsh vegetation is extremely sensitive to oil spills; subsequent cleanup operations are often difficult, if not impossible, to conduct without causing additional damage to the vegetation. The recovery time of coastal wetlands from an oil spill may range from several months to many years, depending on the severity of the spill and the vegetation involved.

The principal adverse impacts of spilled oil contacting seagrass beds and coastal marshes manifest themselves in the death or greatly reduced viability of the vegetation involved. Death of seagrasses causes loss of habitat and biological productivity. The same is true for marsh destruction, but in addition, marsh loss results in soil erosion and land loss, which represents a permanent adverse impact on coastal habitats. Although unlikely, the possibility exists that a relatively large oil spill contracting sensitive coastal habitats would be followed by another spill in the same area. The cumulative effects of successive oil spills on coastal habitats would be severe and long-term (USDI, MMS, 1983c).

Benthic Communities - Oil spills, although possible, are not expected to pose a risk to live bottoms, coral communities, or topographic highs because of the depth of water at which these resources are found. However, with a drilling rig at or very near a reefal area, the risk to the live bottom area would increase in the event of a blowout or oil spill accident. Were one to occur, the effluents could impinge directly upon the live bottom area. Impacts then could be serious to the local biota (USDI, MMS, 1984b). Long-term impacts to the live bottom, coral and coral community, and topographic high offshore resources could occur if the water quality of the offshore Gulf waters seriously deteriorated. See Section IV.A.3. for a discussion of oil in the water column and the following section on water quality.

Endangered Species - An accidental oil spill occurring onshore would have a minimal impact on endangered and threatened species habitat with the possible exception of those species whose established nesting areas are on the ground. Habitat destruction and some mortality could occur, but these impacts would be short-term and localized.

Oil spills contacting a turtle nesting beach during egg incubation or hatching periods (July-August) could cause significant turtle mortality. According to Fritts and McGehee (1981), "For oil to reach the nesting zone, it must be transported there by extremely high tides. Since saltwater inundation is known to kill developing sea turtle embryos (McGehee, 1979), such a peturbation, even in the absence of oil, might cause clutch mortality." Fritts and McGehee also conclude that "from a management viewpoint, turtle nesting beaches are not as vulnerable to petroleum damage as might be expected, because "the most drastic effects of a one-time oil spill are relatively short-lived and would threaten at worst a single year's reproductive effort." Some evidence indicates that juvenile sea turtles are transported by passive drift and are associated with density shear lines and sargassum weed. This could prolong their exposure to a large oil slick transported in a similar manner. Sea turtles, especially juveniles, will snap at or attempt to swallow any object of an appropriate size, such as tar balls. Tar ball ingestion has been recorded and could result in considerable mortalities. Sea turtles must surface to breathe and could contact surface oil slicks. The volatile, soluble and tar factions of an oil spill could affect the lungs of sea turtles reducing ventilation and reducing time for feeding. Ingestion of oil could affect the gastrointestional tract by reducing absorption. Oil coating the head and eyes could affect the orbital salt glands which may affect many physiological processes.

No injuries or impacts to whales have been documented form oil spills. The brown pelican may be affected by the coastal impact of spills. The pelican is extremely susceptible to disturbance and habitat alteration of nesting areas; this may cause nest desertion and egg losses. Brown pelicans may be further susceptible to oil spills because as they dive for fish their feathers could be coated with oil. This may contribute to direct mortality or could result in a secondary impact of reduced hatchability of eggs that may become oiled by contaminated adult birds (USDI, MMS, 1983c). Oil spills contacting habitat utilized by the endangered manatee would cause significant adverse impacts to this species.

Other Wildlife Including Migratory Waterfowl - Pelagic birds may be susceptible to oil spills because as they plunge-dive for fish their feathers could be coated with oil. This may contribute to direct mortality or could result in a secondary impact of reduced hatchability of eggs that become oiled by contaminated adult birds.

Oil spillage could potentially affect marine mammals, but evidence shows it to be unlikely. Dolphins have been observed swimming and feeding in oil slicks with no apparent ill-effects. Oil apparently does not adhere to their smooth skin. Dolphin skin exposed to gasoline and crude oil for up to 75 minutes became discolored but otherwise showed no evidence of damage. It is unlikely that dolphins would inhale oil into their blowhole while breathing. Some hydrocarbon-contaminated food or water could be ingested by marine mammals, but the effects of long-term accumulation of hydrocarbons in marine mammals is unknown.

Of the coastal and marine birds discussed above, the diving seabirds and waterfowl are probably the most vulnerable to OCS oil spills. The more likely bird species to be affected are: common loon, horned grebe, double-crested cormorant, red-breasted merganser, lesser scaup, tern, and gull species.

The effects and variability of bird species' susceptibility to oil pollution are well documented. Crude oil is less toxic than refined oils (diesel oil, Bunker "C", etc); and fresh oil causes more damage than older, more weathered oils. Direct oil contact usually causes substantial bird mortality. Oiling of birds causes death from hypothermia, shock, or drowning; oil ingestion significantly reduces reproduction in some birds; and oil contamination of eggs by oil-fouled adult birds reduces egg hatchability.

Indirect effects of oil pollution on birds include contamination, displacement, and reduction of food sources. Long term contamination of food sources and habitats may cause chronic toxicity to birds through the accumulation of hydrocarbon residues and may affect their behavior, physiology, and reproduction. Data have shown that birds may tend to avoid areas of oil spills on beaches and open water (USDI, MMS, 1983c).

Commercial Fishing - Commercial fisheries may be adversely impacted by an oil spill. Soluble aromatic hydrocarbons can be lethal to adult fishes in low concentrations (1-100 ppm) and to the more sensitive larval stages at even lower concentrations (0.1-1 ppm). Crustaceans appear to be the most sensitive (1-10 ppm) while fish and bivalves are moderately sensitive (10-100 ppm); however, lethal concentrations may be lower (0.2-1 ppm) for the more sensitive larval and juvenile forms. Certain fish eggs are extremely sensitive to the influence of oil products.

Oil spills that contact the coastal marshes, bays, and estuaries have the greatest potential for damage to offshore commercial fishery resources. The majority of the Gulf's fishes are estuarine dependent. Potentially, oil spills could seriously impact fishery resources such as shrimp, crabs, and many species of finfish that use these areas as nursery and/or spawning grounds, as well as sessile organisms such as oysters.

Although a major oil spill would have negligible effect on the migratory habits of the Atlantic blue crab, serious impacts could result if oil were to contact breeding areas. Because marshes and estuaries tend to trap and retain floating oil, a spill could cause mortalities to adult species and their eggs as well.

An offshore oil spill that does not contact the bays could still destroy large numbers of floating eggs, larvae, and juveniles and could disrupt fishing (such as reef fishing or shrimping) if the spill occurs in close proximity to the localized fishing area. The duration of the impact would probably be short-term (less than one year in duration) (USDI, MMS, 1983c).

Recreation/Tourism - Crude oil, or its residue, that finds its way onto shoreline resources will impact recreational areas and, consequently recreational use. Should a major spill affect a shoreline recreational area, public use and enjoyment of the area would be precluded during the time that oil covered the beach or the shoreline area and during the clean-up process. Oil cast upon a beach or shoreline area would impact the aesthetic value for both users and owners. These impacts would be more keenly felt if the area is extensively used or considered as having unique or outstanding recreational value. The effects of an oil spill would vary depending on the size, duration, season, and specific location of oil coming onshore.

Not only would the impacts of an oil spill be felt by recreational users of an area, but also in the business community where economic well-being depends on the use of recreational resources by tourists (USDI, BLM, 1979). Should a pollution incident retard recreational use, then tourism and ultimately local economy could be affected. For example, if during the height of the recreational season an oil spill extends to shoreline areas such as beaches, a resultant loss would be felt in the economy because residents and tourists would be unable to use the contaminated area or an area undergoing clean-up. Activities such as swimming, water skiing, diving, boating, spearfishing, and fishing for finfish and shell fish would be precluded in the areas tainted by an oil spill. Water enhanced activities such as beachcombing, camping, or sunbathing on beach or marine associated shorelines would also appear less attractive for an indeterminate period of time in an oil spill area. Oil contaminated waters would be avoided during the duration of the spill by both recreational boaters and sports fishermen. Some beachfront wildlife appreciation, hunting or fishing in wildlife conservation areas could be temporarily precluded in a worst case oil spill impact situation (USDI, BLM, 1981).

Impacts similar to those occurring from the Ixtoc I and Burmah Agate oil spills could be expected if an oil spill reached the eastern Gulf coastline. The investigation of the Ixtoc I and Burmah Agate oil spills, which occurred in the Gulf of Mexico in 1979 (Restrepo and Associates, 1982), considered the entire Texas coast and found subregional economic impacts amounting to approximately $3 million on the recreational sector and $4 million on the tourism sector. The economic impacts suffered by the recreational sector were not equally distributed within each subregion but were confined to a small number of beach and nonbeach-related businesses located close to the water's edge. Some social losses (the value of the day at the beach foregone because of a spill) are difficult to detect and measure in dollars and cents, especially in the recreational sector where many user occasions are not reflected in market transactions. All detectable impacts occurred in the year of the initial spill, Seasonality and media coverage were shown to influence the severity of the oil spill impact on recreational tourism. Damages to the tourism and recreational industries from oil spills have been temporary (less than one year) and compensable (USDI, MMS, 1983c).

Cultural Resources - Indirect impacts to onshore and offshore archaeological sites could result from both major oil spills and chronic, low level hydrocarbon contamination and would include destruction of the C-14 dating potential of prehistoric sites, and visual impacts to sites through direct contamination of a site or through contamination of the surrounding environment (USDI, MMS, 1983c).

Water Quality - In addition to that portion of hydrocarbons resulting from natural sources due to submarine seepage and from biochemical synthesis, the accidental discharge of petroleum hydrocarbons into the Gulf's water can be expected to impact the water quality of the Gulf. These hydrocarbons may be transported to benthic sediments, entrained, or released into the water column over a period of time, or may be taken up by a variety of benthic and pelagic marine organisms.

Petroleum hydrocarbon discharges, due to oil spillage, are events whose occurrence and volume are not easily predicted and depend upon numerous variables as to their volume, oil type, and effects on the marine environment. Their impacts on open ocean water quality would be significant although of a temporary nature in the case of a large acute spill. Physical oceanic processes would aid in mechanically breaking up oil slicks and contribute to weathering the oil along with photochemical oxidation and biological processes. Weathered oil would eventually sink to the bottom and become incorporated into benthic sediments where further oxidation would occur. Oil spilled into estuarine environments would pose a more serious problem due to the lessening of weathering processes. These hydrocarbons may be entrained in estuarine sediments and re-released into the water column during the tidal cycles. The reworking of these sediments by physical forces (tides, currents, and waves) and by bioturbation would counteract the effects of burial and reexpose hydrocarbons to continued biochemical interactions with the sediment-water interface.

Both large volume oil spillage and smaller oil spills not contacting the shoreline or cleaned up will weather and eventually sink to the seabottom or remain suspended as tar balls in the water column at different density gradients. That oil incorporated in benthic sediments will undergo further oxidation or be re-released into the water column. Benthic or pelagic tar residue could be taken up by a variety of marine organisms. The life of a tar ball has been estimated to be between 1-2 years. Louisiana crude and other northern Gulf of Mexico oils do not seem to form tar balls. Long-term regional water quality degradation is expected to be very low, if at all, as a result of accidental release of petroleum (USDI, MMS, 1983c).

Air Quality - Degradation of air quality in coastal areas due to evaporative losses from oil spills is not expected to occur due to the rapid breakup that normally occurs and the low level turbulence and offshore variability associated with offshore winds. These two factors would be very effective in dispersion of these emissions except when a major spill occurred near land and remained fairly cohesive, and local winds prevailed in the onshore direction at the time of the event. A large spill (10,000 bbls) could emit hydrocarbons at the rate of 570,000 lbs/hr (258,552 kg/hr) and 290,000 lbs/hr (131,544 kg/hr for the first and second hour, respectively). Additionally, evaporation losses throughout the first 10 days could amount to 45% of the spill. In such a situation, short-term degradation of onshore air quality could occur (USDI, MMS, 1983c).

5. Oil Spill Containment/Cleanup Capabilities and Effectiveness

Along the Eastern Planning Area coastline (which includes U.S. Coast Guard Marine Safety Office areas; Mobile, Tampa, and Miami) 16 establishments occur which maintain oil spill response equipment and 18 cooperatives, private or government operatives, or contractors exist whose sole purpose is oil spill response (USDI, MMS, 1985).

Offshore containment/cleanup operations are major tasks requiring significant coordination and cooperation, transportation of large equipment, vessel support, aircraft support, set-up and maintenance of a command/coordination post in the field, and properly staged and available equipment. Often, the weather/sea conditions and crew fatigue become the critical factors during these operations. As the seas approach heights in excess of 2m (5 ft), these operations become increasingly more dangerous and ineffective. Offshore containment/cleanup operations are, in general, marginally effective. It is possible, however, to contain a platform spill if environmental and logistical conditions are right. The effectiveness of this type of containment and cleanup operation is estimated to be approximately 5-15% recovery (USDI, MMS, 1985).

The effectiveness of a containment/cleanup operation in an inshore area largely depends on the unique physical characteristics of the environment and the area of the operation. The range of effectiveness is from marginally sucessful to successful (USDI, MMS, 1985).

B. ENVIRONMENTAL IMPACTS OF EXPLORATION ACTIVITY

1. Impacts Concerning the Physical Environment

a. Impacts Concerning Geologic and Other Hazards

Proposed activities related to the hydrocarbon production on the OCS in the AEA area would be affected by such geologic conditions as karst and unstable slopes, which may present operational constraints related to their respective characteristics.

Most structures and equipment used for mineral exploration and development can be designed to withstand the stresses of the continental shelf environment if adequate information is available. Studies developed under the former Bureau of Land Management (BLM) Environmental Studies Program (now MMS) have been especially directed toward areas where more detailed geologic information was needed for intelligent management of the OCS mineral leasing program. BLM geologic studies have provided assessment of operational constraints to oil and gas exploration and production in the eastern Gulf of Mexico.

BLM's MAFLA studies of 1976-1979 have provided geologic information for the west Florida shelf as a base for the survey and research of the marine environment. The survey and research in progress by the U.S. Geological Survey, Corpus Christi, in the eastern Gulf will provide a better accounting of the shelf's geology and will provide the base for a synthesis mapping effort of the operational constraints.

Although some of the potential geohazards have caused serious problems during exploration and development in the central and western Gulf of Mexico, it may be noted that of the wells drilled in the eastern Gulf, no serious accidents have occurred.

Specific geologic and man-made hazards located within the area of the proposed activities would be addressed in an SEA, based on data obtained from a geophysical/hazard survey by the operator using remote sensing equipment such as a pinger profiler, subbottom profiler, proton magnetometer, and side-scan sonar. From these data, the subsurface geologic structure, the configuration of the seafloor, locations of ferromagnetic material both above and buried below the seafloor, and objects on the seafloor of a hazardous nature to the proposed activity would be determined. Objects of these kinds would be found as debris thrown overboard from passing vessels, construction related material lost during the proposed operation, sunken vessels, ordnance, pipelines (if any existed in the area), reefal outcrops, and others.

Close proximity of proposed activities to geologic or man-made hazards within the area of the AEA would require (1) avoidance by relocation of the activity to a less hazardous environment, unless removal of the object is feasible, (2) modification of the plan to mitigate the potential impact of the hazard on the planned activity, or (3) disapproval of the plan. The RD, MMS notifies the lessee through NTL 83-3 that should geohazardous conditions exist, that precautions must be taken in site selection and structure design. Industry is responsible for minimizing and/or avoiding geohazards which exist within the lease area (USDI, MMS, 1984b). Since disapproval of the plan could prevent discovery and development of much needed hydrocarbon resources and would result in loss of royalty income to the United States, either avoidance of the hazard and/or modification of the plan would be the most likely alternatives as minimal impacts are anticipated.

Hydrogen Sulfide Gas - Necessary precautions for hydrogen sulfide gas are prescribed in OCS Order No. 2, "Drilling Procedures" for the area of this AEA and for other areas of the OCS. Operating practices set forth in United States Geological Survey OCS Standard "Safety Requirements for Drilling Operations in a Hydrogen Sulfide Environment," No. 1 (GSS-OCS-1), First Edition, February 1976, or subsequent revisions thereto, are referenced in the Hydrogen Sulfide Section of OCS Order No. 2.

b. Impacts Concerning Meteorology

Significant severe weather conditions are an exception rather than a rule in the east central Gulf. Approximately 90 percent of the time weather will not affect exploratory activities (USDI, MMS, 1984b,; Visual No. 6). Several weather factors could affect some phase of operation. First, dangerous conditions can be expected at least once each year during hurricanes. Damage to facilities can be expected during a great hurricane. Second, severe winter storms may cause delays in the operation but should not cause structural damage as these storms are short-lived, 24-36 hours, and do not have time to build up a destructive ocean wave. Third, in the winter months, dense fog may hamper navigation and thus interfere with supplies for several days. There is little or no evidence that any offshore operations will affect or be very much affected by the general meteorological conditions in this area.

c. Impacts Concerning Physical Oceanography

Exploration activities in the analysis area are not expected to have any effect on the physical parameters (currents, tides, and wave activity) of the environment. Regulated discharges and other exploration activity are not expected to have an effect on sea temperature or salinity other than a very localized effect near discharge outlets where the dispersion and diffusion processes begin.

Oceanographic conditions such as high velocity currents, large waves, storm surge, etc., could adversely affect exploration activities in the analysis area. Although mechanical equipment and operations procedures are designed to cope with extreme environmental conditions, it is not common practice to design for maximum conditions that could be encountered in the working area but rather to some maximum expected condition over the life of the structure or operation i.e., a 25-year wave, 30-year storm, etc. Thus, it is possible during the lifetime of a structure (even during short-term exploration) that the design limits of the equipment may be exceeded, or mechanical degradation and/or minor failures may progress to the point that physical conditions less than the design limits could result in major failure.

Environmental conditions that may lead to an adverse effect on exploration are summarized herein. For additional information regarding the physical parameters of the oceanographic environment, see Section III.A.3. Cyclic loop current intrusion into the analysis area sets up high velocity movement of water (maximum velocity to 2m/sec (approx. 3.8 kns) or higher).

High velocity storm winds may cause upper layer water velocities to approach 60 cm/sec (1.2 kns) and waves to approach 13m (approximately 43 ft) in height. Extremely high winds and turbulent water conditions could cause a column of air (unknown in height) directly above the sea surface to become near saturated with water. The effect of this saturated air forcefully blowing on a structure imposes major forces. The combined effect of this phenomenon, in addition to the forces imposed by high waves and currents during a storm, may cause major structural damage and/or failure in conditions less than design limits (USDI, MMS, 1984a).

d. Impacts on Water Quality

Under normal offshore operations, varying degrees of water quality degradation would occur as a result of oil and gas exploration activities in the analysis area. Wastes from these activities are varied and may be transformed chemically, biologically, or radioactively when introduced into the marine environment. These wastes may be dissolved and form new substances or be mixed vertically and horizontally in the water column by small-scale motions or large-scale currents. They may fall into the bottom sediments to be recycled by these same processes. This series of transformations or chemical reactions will govern a waste's transport through the water column and its toxicity to marine organisms. The bio-effects described may be on individual organisms or whole ecosystems, with long-term effects such as changes in reproductive habits or genetic make-up of species occurring. The method of delivery to the environment as well as intrinsic chemical properties of each source would influence a waste's distribution throughout the area (USDI, MMS, 1984a).

Due to the complexity of waste movement and behavior, several parameters are needed to determine the extent of impact. Specification of point source functions, the form of the waste, rate of release, frequency of disposal, and geographical location of disposal are parameters essential in determining the extent of impact on water quality in the area. Also important are the resources impacted, the duration of impact, and the period of recovery. Potential water quality degradation resulting from offshore oil and gas exploration would be governed by several factors, which include the resuspension of bottom sediments through exploration activity; the discharge of deck drainage; sanitary wastes, and domestic wastes; the discharge of formation waters; the discharge of drilling fluids and muds; accidental hydrocarbon discharges due to spills, blowouts, etc.; and the discharge of radionuclides into the marine environment.

Impacts resulting from resuspension of bottom sediments may include increased water turbidities and mobilization of sediments in the water column containing highly concentrated pollutants. The magnitude and extent of any urbidity increases would depend on the hydrographic parameters of the area, duration of the activity, and bottom material composition. The toxic effects of some of these pollutants could be long lasting in confined areas, depending on the quantities disturbed, local hydrographic effects, and the biota of the immediate area.

The discharge of treated sanitary and domestic wastes from the various facilities regulated by National Pollutant Discharge Elimination System (NPDES) permits will increase levels of suspended solids, nutrients, chlorine, and BOD in a small area near the point of discharge. Some residual chlorine may be present in discharged waters following treatment; however, due to evaportion and conversion to other chemical forms when combined with seawater, it is quickly diluted.

The discharge of formation water and chronic spills from drilling rigs would result in increased petroleum hydrocarbon levels and possible trace metal concentrations in the marine environment. Formation waters may contain high concentrations of total dissolved solids, oxygen demanding wastes, and toxic metals, in addition to oil and grease contaminants. Environmentally high levels of naturally occurring radionuclides are also present in these formation waters, up to four levels of magnitude higher than are found in open seawater. Though these levels are high, they do no seem to pose a hazard to the offshore environment due to the rapid dilution of these waters when discharged. Aside from that portion of hydrocarbons resulting from natural sources due to submarine seepage and from biochemical synthesis, the accidental discharge of petroleum hydrocarbons into the Gulf's waters due to blowouts, vessel collisions, etc., can be expected to impact the water quality of the Gulf. Effects of oil spills on water quality are addressed in Section IV.A.4.

The discharge of drilling muds, sand, and drill cuttings, which are regulated by NPDES permits, may create turbidity plumes several hundred yards in length but would only affect those waters in the immediate vicinity of the rig. Drilling fluids, commonly called "muds," perform a variety of drilling functions, such as removing particles cut by the bit, cooling and lubricating the bit as it cuts, maintaining downhole pressure, and stabilizing the walls of the borehole. Most of these muds are water based; however, some have an oil base and are used in special situations, primarily freeing stuck drill pipe. These oil based muds contain carefully formulated mixtures of oxidized asphalt, organic acids, alkali, stabilizing agents, and high flash diesel oil, presenting a high potential for pollution. Aside from the normal use of muds and fluids during exploration phases of oil and gas extraction, well service and tertiary recovery techniques may contribute as sources of wastes and pollutants (USDI, MMS, 1984a). Potential impacts to water quality as a result of a specific drilling activity in the AEA area will be addressed in an SEA. For additional information refer to the FREIS (USDI, MMS, 1983a).

e. Impacts on Air Quality

Marine and helicopter traffic operating out of established bases is not expected to contribute to significant degradation of onshore air quality. The limited number of helicopter and boat trips usually scheduled to support offshore operations should not add a significant amount of pollutants to the air.

Establishing a new onshore support based would add some air emissions onshore. Again, these emissions should not be significant. Maximum emissions of nitrogen oxides from surface vessels, assuming one trip per day, would be near 0.1 ton per day. Other pollutants are about one order of magnitude less. Maximum emissions of carbon monoxides from helicopter landings and take offs, assuming one trip per day, would be near 12 pounds per day. Other pollutants are about one order of magnitude less (USEPA, 1976). Oil spill impacts are discussed in Section IV.A.4.

The major predictable source of air pollutants associated with exploratory activities originates from the stationary combustion diesel engines which provide the power for the drilling rig. Nitrogen oxides (NO_x) would be the predominant pollutant. Other pollutants, carbon monoxide, volatile organic compounds, total suspended particulates, and sulfur oxides would be a much lesser amount (USEPA, 1976).

In a worse case scenario, continuous drilling for 365 days each year, the emissions of NO_x would amount to 217 tons (Radian Corp., 1982). The proposed activities would occur a minimum of 18km (10nm) from shore. Provisions for determining significant emissions from oil and gas exploration and producing activities are contained in 30 CFR 250.57. No significant degradation of the ambient air quality is expected because of the normal mixing and dissipation due to climatic conditions.

Site-specific evaluations will be calculated at the time of submission of an operational plan. This information will be presented in a subsequent SEA.

2. Impacts on the Biological Environment

a. Impacts on Coastal Habitats

Impacts to the coastal environment from exploration activities in the assessment area would result from oil spills, increased boat traffic, and possible new onshore facility construction. Oil spill impacts are discussed in Section IV.A.4. Increased boat traffic alone would cause a slight increase in discharge to the surrounding waters and extra wake disturbance to the shoreline. The expansion of existing onshore facilities or the construction of new facilities could have a serious impact to the coastal environment. Construction might entail destruction of habitat and dredging or deepening of channels.

The destruction of habitat which would occur through the filling of wetland areas and construction of onshore facilities would result in the loss of those functions which the habitats provide. Valuable wildlife habitats and nursery areas for commercially and recreationally important finfish and shellfish would be lost. Wetlands contribute a significant amount of detrital material which constitutes the base of the food web for the entire aquatic system. Elimination of wetland habitat would decrease this important detrital imput. The function of erosion control from the absorption of wind and wave energy by the coastal wetlands and beaches would also be lost or impaired, thus leading to additional habitat loss. The clearing of land, especially in conjunction with the emplacement of nonpermeable surfaces (i.e., buildings and pavement), increases the amount of runoff of an area. Allowing upland runoff to pass directly into the aquatic system without first passing through the natural filtering system of the coastal marsh or vegetative fringe could seriously degrade the local water quality. Filling of wetland areas could also alter natural drainage patterns causing habitat degradation from flooding, standing water, or decreased water supply in or to surrounding areas.

The dredging or deepening of channels for boat traffic associated with the onshore facilities could also cause significant impacts to the coastal environment. Dredging for channels eliminates shallow water habitat and could eliminate productive grass beds. In addition to the loss of ecological functions of the seagrasses, as discussed in Section III.B.1., loss of seagrass habitat along the Florida west coast has been implicated in reduced commercial fishery yields (USDI, MMS, 1983a). Channels often act as a detrital sump by collecting and holding organic debris which is washed into the channel. Without proper circulation, the detrital sump can lead to anoxic water conditions.

Construction or deepening of channels and canals not only causes loss of habitat but also facilitates saltwater intrusion. The conversion of fresh/intermediate marshes to more saline types and the loss of some areas of wooded swamps due to saltwater intrusion have brought about changes in coastal habitat types which have seriously altered the structures of wildlife communities. The replacement of fresh marsh with more saline types has eliminated valuable water fowl habitat and has reduced populations of certain animal species. Elevated salinity also reduces the availability of low-salinity nursery areas vital to shrimp, crab, Atlantic croaker, and menhaden. Additionally, higher salinity in the estuaries predisposes oysters to predation by the oyster drill (USDI, MMS, 1983c).

Various local, State, and Federal regulations, including coastal use permit requirements, control the location of onshore facilities. These regulations mitigate degradation of the coastal environment. The siting of facilities on upland areas and the use of existing channels would minimize the losses of coastal habitat.

b. Impacts on Offshore Habitats

(1) Impacts on the Pelagic Environment

There may be a temporary and localized adverse effect on the phytoplankton and zooplankton due to the plume caused by the temporary resuspension of bottom sediments during placement of offshore structures and the disposal of drilling muds and cuttings during the exploratory phase. The impacts on the plankton would depend on the residence time for the organisms within the plume. Primary productivity could be affected by reducing the photosynthetic assimilation of phytoplankton within the affected area. Zooplankton in the immediate vicinity of the turbidity plumes may be adversely impacted by clogging of the filter-feeding mechanisms or blocking respiratory surfaces.

Other nekton are highly mobile and would probably avoid localized areas of disturbance. Nektonic organisms, especially fish, would be attracted to the submerged rig, especially at night when the rig is well lighted. Observations in the Gulf of Mexico indicate that fish are also attracted to drill cuttings as they settle through the water column. The free-swimming organisms have the ability to evade or swim freely through the plume and experience has indicated that no serious long-term effects would be experienced by these organisms as a result of exploration activity (USDI, MMS, 1984a).

Other types of discharges from the rig, such as engine cooling water or an accidental oil spill, may also affect the pelagic inhabitants. Oil spill impacts are discussed in Section IV.A.4.

(2) Impacts on the Benthic Environment

The impacts to the benthos resulting from exploratory drilling activity would be related to (1) effects of toxicity and smothering from the discharge of drilling muds and cuttings; and (2) mechanical damage due to anchors, jack-up rigs, and the drilling operation itself. See Section IV.D.1.a.(2) of USDI, MMS, 1985, for a full description of potential impacts to live-bottom areas from oil and gas activities.

Most water based muds tested for acute toxicity are "relatively" non-toxic (LC50 values for whole fluids at 1,000 ppm and for suspended particulate phase at 10,000 ppm). The toxic agent in drilling muds is oil, especially diesel, which is used in some drilling systems to increase lubricity, to free stuck pipe, at high temperatures, to reduce corrosiveness of H_2S, or when encountering hydrophilic formations. The normal practice is to use water based muds and to resort to the use of oil only when necessary. Reasons for this are economic as well as environmental. The use of water based muds without oil additives would therefore not affect toxicity related impacts. The impact of using oil in drilling muds on the benthos is not completely known. However, muds are diluted initially upon discharge to approximately 100 ppm concentration. This concentration is limited to within tens of meters from the discharge point and is further diluted away from the discharge (Duke and Parrish, 1984). In addition, the MMS and EPA prohibit the discharge of free oil into the OCS. Discharge of free oil is defined as creating a visible sheen. This prohibition would require that oil based muds not be discharged. Discharge of muds with diesel mud additives could occur as long as no visible sheen were observed. However, this lower oil concentration mud coupled with the dilution factor would probably preclude significant impacts to benthic organisms.

Another potential major impact producing factor to the benthos from exploratory activity is the possible smothering effect of muds and cuttings discharge. On the OCS, about 90% of the discharge settles rapidly, usually within 1,000m (3,281 ft). The cuttings pile may persist or be dispersed depending on the energy of the sea bottom (NRC, 1983). Motile benthos would not be significantly impacted since they could avoid the area of smothering or move up through the deposited effluent. Sessile invertebrates could receive significant impact, however, from burial, coating of surfaces, clogging of feeding or respiratory systems, etc. The extent of the impact from drilling is related to the natural deposition rate and storm induced turbidity and sedimentation in the area. Organisms living in areas of high natural deposition or which are disturbed by frequent storm induced turbidity would probably be adapted to these conditions and not suffer significant impact from drilling operations.

Impacts to the benthos resulting from oil spills are discussed in Section IV.A.4.

(3) Impacts on Sensitive Underwater Features

The impacts to the sensitive underwater features of the assessment area (hard and live bottoms) would be the smothering and toxicity effects resulting from drilling discharge as discussed in Section IV.B.2.b(2). However, recolonization by the live bottom assemblage may be precluded by a modification of the substrate. There have been no studies on the effects of drilling discharges on the benthos of the West Florida Shelf; therefore, exact impacts are unknown. Due to their sensitive nature and high productivity, destruction on these habitats should be avoided.

In order to protect these sensitive habitats, the MMS imposes requirements through a special stipulation attached to all leases on blocks within the 200m (656 ft) isobath.

A "live-bottom" stipulation has been made a part of previously issued leases in the eastern Gulf and is currently a part of many currently active leases on blocks in the eastern Gulf. It should be noted that this stipulation will not prevent the recovery of oil and gas resources, but it will serve to protect valuable and sensitive biological resources. The stipulation is included in its entirety although this AEA is being written to address exploration activities only. The area affected by the stipulation includes the area of this AEA.

The stipulation on existing leases may vary slightly depending upon which lease sale they were leased, but the difference are minor and the intent of the stipulation -- the protection of important biological communities of the area -- remains the same, and is discussed below. The stipulation which would be applied to leases on blocks in the AEA area as of this writing reads as follows:

> This stipulation will apply only to leases on blocks in water depths of 200 meters or less. For activities conducted under Plans of Exploration, the provisions of this stipulation shall apply only in water depths of 100 meters or less. For activities conducted under Development and Production Plans, theprovisions of this stipulation shall apply in water depths of 200 meters or less.
>
> Prior to any drilling activity or the construction or placement of any structure for exploration or development on this lease including, but not limited to, well drilling and pipeline and platform placement, the lessee will submit to the Regional Director (RD) a bathymetry map prepared utilizing remote sensing and/or other survey techniques. This map will include interpretations for the presence of live-bottom areas within a minimum of 1,820 meters radius of a proposed exploration or production activity site.
>
> For the purpose of this stipulation, "live-bottom areas" are defined as seagrass communities; or those areas which contain biological assemblages consisting of such sessile invertebrates as sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozoans, or corals living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography; or areas whose lithotope favors the accumulation of turtles, fishes, and other fauna.
>
> The lessee will also submit to the RD photodocumentation of the sea bottom within 1,820 meters of the proposed exploration drilling sites or proposed platform locations.
>
> If it is determined that the live-bottom areas might be adversely impacted by the proposed activity, then the RD will require the lessee to undertake any measure deemed economically, environmentally, and technically feasible to protect live-bottom areas. These measures may include, but are not limited to, the following:
>
> (a) the relocation of operations to avoid live-bottom areas;
>
> (b) the shunting of all drilling fluids and cuttings in such a manner as to avoid live-bottom areas;
>
> (c) the transportation of drilling fluids and cuttings to approved disposal sites; and
>
> (d) the monitoring of live-bottom areas to assess the adequacy of any mitigation measures taken and the impact of lessee initiated activities.

Since live-bottom areas are poorly mapped and apparently randomly scattered on the Florida Shelf, this stipulation would require an interpretation for and the identification of live-bottom areas in the Eastern Gulf where it is believed such areas may exist.

The stipulation would: (1) require the interpretation for and identification of live-bottoms in water depths up to 100m for exploration activities, and up to 200m for development activities; (2) require photodocumentation for any potential live-bottom areas; and (3) provide for protective measures to be taken if live-bottom areas are discovered within 1 nmi of the well site.

The provisions of this stipulation were developed by DOI in consultation with the State of Florida, which has expressed great concern about the potential damage that oil and gas operations may cause to valuable live-bottom areas. Live-bottom areas are considered important as commercial fish habitat, as recreational fishing and diving areas, and for their intrinsic value as beautiful coral and tropical biota habitat.

If live-bottom areas are identified near where drilling is to take place, several remedies are available to DOI for protecting the live-bottoms, such as requiring the well location to be moved away from live-bottom areas, disposal of drilling fluids and cuttings away from the area, or monitoring the impact of the drilling operations on the biota of the nearby live-bottom.

The ability of geophysical technology and photographs, which would be required by the stipulation, to locate live-bottom areas has been amply demonstrated on previously issued leases in both the eastern Gulf and the south Atlantic leasing areas. The avoidance of a live-bottom area will, of course, protect it from mechanical damage. Monitoring the impacts of nearby oil and gas activities on the biota of a live-bottom while not of itself providing protection for that specific operation, will add to our knowledge of such impacts for use during that and subsequent operations; if any impacts are detected by the monitoring program, other protective measures may be instituted for that operation, including moving the activity further away from the live-bottom. Shunting all drilling effluents to close to the bottom is effective in areas of relatively high relief (greater than 15m) since the shunting will put any potentially harmful effluents in the bottom boundary layer, preventing them from reaching the level of the biota that is being protected. Barging of the effluents away from the live-bottom area is considered a method to be used only if there is not other effective method available, not only because barging creates new problems of where to dispose of the material, but also because it would not be wise to have a barge load of potentially harmful material located over an area one wants to protect when a storm comes through the area; the capsizing or sinking of such a loaded barge could do far more damage to a live-bottom areas by dumping a large amount of material on the live-bottom than the slower, intermittent normal surface discharge would. In any event, the decision of which method of protection to be used would be made by RD in consultation with the FWS and the appropriate State(s). NPDES permits issued by USEPA may also have the provisions of this "live-bottom stipulation" incorporated into them. Furthermore, a live-bottom stipulation is a part of all currently active leases in the eastern Gulf in water depths of 100m or less, and it is in many leases in water depths up to 200m.

Experience with the stipulation to date shows that it is indeed working to identify and protect live-bottom areas. Furthermore, any oil and gas resources present under such live-bottom areas could be recovered using directional drilling techniques

This stipulation would reduce the potential impact of this proposal on the coral and live-bottom areas of the eastern Gulf from very high to very low by requiring the positive identification of live-bottom areas (including seagrass areas) prior to any drilling activity, allowing the RD to take effective action on a case-by-case basis to protect the identified live-bottom area. Since live-bottom areas vary in their productivity, biomass, diverseness, and uniqueness, so will the protective measures vary. Prudent management and consultation with other interested parties, such as FWS and the affected States, in evaluating the presence of live-bottom areas will ensure that such areas receive necessary and sufficient protection from the impacts of nearby oil and gas operations.

The wording of the stipulation was developed in consultation with FWS, USGS, and the affected States. It has been in place on leases in the eastern Gulf for over eight years and is also in place on active leases in the south Atlantic area. The evidence of monitoring reports in the south Atlantic, and Environmental Reports and any required live-bottom reports in the eastern Gulf supports the contention that this stipulation is working to identify and protect live-bottom areas. Absent this stipulation, live-bottom areas could be undetected and may be seriously damaged by oil and gas exploration and development activities.

This stipulation has been deemed necessary in the past by the Secretary since the sensitive and high value live-bottom areas are poorly known, low-relief (or no-relief), patchy, scattered, and unmapped.

In conclusion, this biological stipulation serves to reduce the very high potential impacts that could be realized by the biota of coral and live-bottom areas from activities resulting from this proposal to very low impacts without affecting the amount of oil and gas resources that could be recovered in the area.

In order to provide guidance for the proper implementation of the photo-documentation provision of the Live-Bottom Stipulations guidelines were issued by the MMS Gulf of Mexico OCS Regional Office on February 17, 1984; copies may be obtained from that office.

It should be noted that the provisions of this stipulation differ slightly from sale to sale; as new knowledge is gained through the MMS Environmental Studies Program and through consultation with other Federal and State Agencies, specific details of the stipulation are modified to take this new information into account. The basic intent of the stipulation, however, remains unchanged: to identify and protect important and sensitive live-bottom communities. For instance, leases which resulted from Sale 79 require implementation of the live-bottom stipulation for Plans of Exploration on all blocks south of 26° latitude, regardless of water depth. Furthermore, another stipulation on leases south of 26°N, again as a result of Sale 79, provided that "No application to implement an approved exploration plan through the Application for Permit to Drill (APD) process will be approved prior to completion of physical oceanographic and biological resource studies currently underway. These studies are scheduled to be completed by December 1985. If this requirement results in delay in approval of APD's, the lease may be suspended in accordance with 30 CFR 250.12(a)(1)(iv) with notification to the lessee by the RD. The term of the lease will be extended to cover the period of such suspension."

It is expected that the required reports will be submitted so that such APD's may be approved south of 26°N by the summer of 1986.

Impacts to specific live-bottoms will be assessed in an SEA based on the findings of the live-bottom and photodocumentation surveys. Appropriate mitigative measures will also be discussed.

Impacts to live-bottom resulting from oil spills would be the same as those to the benthos.

c. Impacts on Endangered or Threatened Species

In accordance with Section 7(c) of the Endangered Species Act of 1973, as amended, consultations on the proposed Gulf of Mexico OCS Lease Sales 94, 98, and 102, were held with FWS and National Marine Fisheries Service. The biological opinions from these agencies (Appendix 1) indicate that leasing and exploration activities associated with this area are not likely to jeopardize the continued existence of the listed species considered in the consultations or result in the destruction or adverse modification of their critical habitats. However, FWS indicated that consultation must be reinitiated should any additional onshore facilities be established along the Gulf coast in support of exploration activities, particularly south of Tampa Bay, Florida (Port Manatee).

Of the threatened and endangered species discussed in Section III.B.3, the West Indian manatee, loggerhead and Atlantic ridley turtles, and American crocodile were selected as being more vulnerable to OCS oil and gas related impacts in or adjacent to the AEA area. At the time that they were consulted, the FWS also regarded the eastern brown pelican to be of concern with respect to OCS oil and gas related impacts. Since that time, the pelican was removed from the list of Endangered and Threatened Wildlife in all coastal areas adjacent to the AEA area.

Increased support vessel traffic between onshore service bases and offshore drilling sites could result in collisions with basking loggerhead and Atlantic ridley turtles. The level of this problem is unknown and requires additional research. Lights on the drilling rig could also attract or disorient loggerhead hatchlings during their post-natal drive to reach favorable currents. Studies have not been conducted to determine the impact of oil and gas operations on marine turtles and their habitat; therefore, such impacts are difficult to evaluate.

The primary reason for the endangered status of the manatee is attributed to mortality from collisions with boats and barges. The projected facility expansion and increased offshore support boat traffic in the Tampa Bay and Port Manatee areas could result in boat collisions with manatees. Port Manatee is currently used as a supply base for offshore support boats (about 3-7 trips/week). This boat traffic is about 5% of the annual vessel traffic into the port, and it is projected that support boat traffic could increase 50% as a result of increased exploratory activity in the AEA area (about 5-11 trips/week). The boats follow a marked deepwater channel (10-12m or 34-40 ft in depth) from Port Manatee through Tampa Bay into the Gulf and then proceed to an offshore drill site. While this route does not intrude into the designated critical habitat of the manatees (nearest point is about 8km or 5 mi), it is possible that these boats may encounter manatees during their peak migration in March and November (USDI, MMS, 1984b). Such chance encounters translate into a very low level of impact on endangered manatees.

Impacts to the American crocodile (other than those associated with oil spills) appear to have a low probability. It is unlikely that onshore support bases would be located in areas which would impact the American crocodile by generating increased boat traffic.

Boat collisions with whales are also possible but considered unlikely. Increased marine traffic could disrupt feeding and/or migration behavior, and traffic collisions involving these animals could increase. Data are not available to adequately estimate the impacts which could result from the above described activities; therefore, probable impacts on marine mammals and their habitats cannot be predicted with any degree of reliability.

No coastal facility construction is projected to occur near turtle nesting beaches along the Florida Gulf coast; therefore, adverse impacts to turtles from coastal construction is unlikely. Coastal facility construction is not expected to impact the other coastal endangered species since most of their habitats are protected and are therefore unavailable for facility siting.

Oil spill related impacts to endangered or threatened species are discussed in Section IV.A.4.

Impacts to specific endangered or threatened species will be addressed in an SEA.

d. Impacts on Breeding Habitats and Migration Routes

The major impact producing agents which could potentially impact the breeding habits and migration routes of species in the AEA area include OCS related oil spills, disturbance from onshore facility construction, and collisions with marine vessels and aircraft. Refer to Section IV.A.4. of this AEA for a discussion of potential oil spill related impacts.

Exploratory drilling operations within the AEA area will most likely utilize existing onshore support facilities, probably Tampa/Port Manatee. Refer to Sections III.C.3 and IV.C.3 for additional information. The proposed facility expansion and increased offshore boat traffic in the Tampa and Port Manatee and San Carlos Island (USDI, MMS, 1984b) areas is not expected to impact the breeding habits or migration routes of species in the area. However, if large quantities of reserves are discovered, construction of additional onshore bases may be necessary. It is likely that such construction, if undertaken on a large scale, could impact onshore species. However, because it is assumed that any new construction will take place in well-developed areas, and that the activities will be consistent with the State's Coastal Zone Management plan and Federal and State regulations and permitting requirements, impacts to coastal species should be sufficiently mitigated.

Increased OCS related traffic between onshore support bases and offshore drilling sites could result in collisions with marine mammals, turtles, and birds. The current level of such impacts is unknown and it is difficult to predict to what extent such impacts could increase without additional research. However, it is believed that the current impact level is very low and unlikely to increase substantially as a result of increased activity in the area.

Potential impacts to specific endangered/threatened species are discussed in Section IV.B.2.c of this AEA.

e. Impacts on Protected Areas of Biological Concern

Impacts to those areas described in Section III.B.5. would be limited to oil spill impacts since these areas would not be available for the construction of onshore activities. Impacts resulting from oil spills to these types of coastal environments are discussed in Section IV.A.4.

C. IMPACTS ON SOCIOECONOMIC CONDITIONS AND CONCERNS

1. Impacts to Economic and Demographic Conditions

The socioeconomic effects expected to result from offshore exploratory drilling operations in this area are minimal due to the transitory nature of the activity. There is little incentive on the part of the industry to establish extensive facilities or for workers to establish permanent residences prior to the proven existence of commercial quantities of hydrocarbons (Herbert and Lampl, 1983).

a. Impacts on Local Employment

Employment in the oil and gas industry is affected by many factors including the production of crude petroleum and natural gas, level of petroleum refining activity, and meteorological conditions. The probable result of exploratory drilling on any given lease in the AEA area would be an incremental addition to the existing level of employment in exploration related activity. Small numbers of employees may be relocated to existing or temporary facilities for a short duration.

Site-specific information, including estimates for the number of local residents to be employed in offshore, onshore, and transportation activities will be addressed in an SEA.

b. Impacts on Local Population and Industry Centers

Most of the personnel engaged in exploratory drilling activities will not change their places of residence. Minimal effects upon local population centers and industry are expected.

2. Impacts on Land Use

a. Impacts on Increased Demands on Community Services

Previous exploration activities in the area were supported by existing community services; therefore, minimal impacts are expected.

b. Impacts of Increased Boat and Air Traffic

Marine vessel and helicopter operations between onshore support bases and offshore drilling rigs will insignificantly increase; therefore, additional vessel traffic in support of operations in the AEA area should not significantly affect the existing vessel traffic.

c. Impacts of Competition for Scarce Coastal Resources and Demands for Goods and Services

Previous exploration activities in the area were supported by existing services and supplies; therefore, negligible demands for AEA area coastal resources, goods, and/or services or minor adverse impacts on the quality of community infrastructure are expected. The typical types and quantities of materials transported offshore to a drilling rig in one year are shown in Table IV-7.

Table IV-7

Types and Quantities of Materials Transported Annually Offshore to an Exploration Rig

Type	Quantity
Fuel	10,000-15,000 bbl
Drilling Mud	2,000-5,000 tons
Cement	1,000-3,000 tons
Freshwater	5,000,000-7,500,000 gal
Tubular Goods	2,000-3,000 tons

Source: French and Parsons, 1983.

Site-specific information for the following sections will be addressed in an SEA:

(1) Supplies and Equipment

(2) Water

(3) Aggregate Energy

(4) Other Resources

3. Impacts of Construction of Onshore Support Facilities

During the exploration phase of oil and gas resource development, primary impacts would be those associated with the construction and operation of onshore support facilities. Large diversified communities are more capable of absorbing extensive service base development than are small communities which are primarily dependent on a single activity (Florida State University, 1975).

Methodology used by industry for determining site locations involves three important considerations in the decision-making process: the type of offshore activity, the general location of the site, and the projected length of stay (Kelly, 1983). Proximity to offshore OCS activities is generally the most important factor in determining the location of onshore facilities. Another important consideration is the tendency for OCS support activities to aggregate or locate in a central geographical area, usually in a port area. The tendency to cluster near other related industries would meet the need for cooperation and interaction among the support activities. Economic efficiency may be achieved by minimizing the duplication of facilities and equipment.

A discussion of facility requirements, siting considerations, and impacts follows.

Service bases provide transportation, services, and storage for drilling equipment, supplies, personnel, and other necessities to and from OCS oil and gas rigs and platforms. Transportation to offshore operations usually depends upon supply boats for equipment and materials and crew boats and helicopters for personnel. Usually at least two supply boats, one crew boat, and one helicopter are necessary to support each drilling rig or platform. Where drilling is located far offshore, more vessels and helicopters may be needed because of excessive travel time. Transportation onshore is by rail, road, air, and water.

Service bases require at least two berths, each about 122m (400 ft) long, per rig. Fewer vessels and helicopters may be required if several rigs are serviced from the same base. Depending on the distance to the rig and the nature of offshore OCS operations, at least two vessel trips and one helicopter trip per rig are required daily. Temporary service bases are established as soon as exploration and early development begins. Temporary bases may be expanded into permanent service bases but only after significant discovery of oil or gas has been made. In addition to the general factors affecting location, service bases and berthing facilities, usually have specific siting considerations and impacts (French and Parsons, 1983) (Tables IV-8 and IV-9).

An assessment of the potential onshore facility use resulting from Eastern Gulf Sale 94 leasing activities in the Eastern Planning Areas E-3 and E-4 has concluded the use of 1-3 additional new service bases for exploratory drilling. Likely potential locations for all these new facilities are in the Tampa Bay area, namely in Manatee County (Port Manatee), and Hillsborough

County (at one or more existing port industrial areas). A small service base supporting a limited amount of exploratory drilling activity might be located in Lee County (San Carlos Island at Mataganas Pass near Fort Myers Beach). While Port Boca Grande offers a possible site for a service base, it is not considered a likely location because of inadequate road access, potential adverse impacts, and potentially significant public opposition. The Tampa Bay Regional Planning Council (1982) in its Coastal Energy Facilities Siting Study analyzed a number of potential sites which have available land, suitable in varying degrees for OCS onshore support facilities, and selected four port sites as having the highest potential for accommodating such facilities: Port Manatee, Hookers Point, Port Sutton, and Big Bend/Port Redwing. The Southwest Florida Regional Planning Council (1983) in its report Outer Continental Shelf Onshore Facilities Siting Study evaluated potential sites and concluded that only two sites had a realistic potential for OCS development: Port Boca Grande and San Carlos Island. The disadvantages and potential impacts of these sites were cited, as well as potential public opposition, particularly with respect to Port Boca Grande. In this regard, the Council has voted to recommend that Port Boca Grande not be considered as a site for onshore OCS facilities.

Coastal subarea E-4x might be considered as the potential location (Monroe County in the Key West area) for a possible marine terminal facility. However, because of the scarcity of suitable sites, the potential impacts of developing and using a site in this area, and the potential for significant public opposition, this area is considered an unlikely location. It is noted that the South Florida Regional Planning Council (1983), in its Outer Continental Shelf Facility Siting Study, prepared siting maps for temporary and permanent service bases. The facility siting maps show no potentially suitable sites for any of these facilities in the Key West-south Florida Keys area (the Port Everglades area south of Fort Lauderdale is identified as having the largest number of potentially suitable sites for these facilities). The study also notes that terminal facilities already exist in Key West which could be used (if available) for potential OCS-related transshipment operations. Nevertheless, as stated above the Key West area is considered an unlikely location for a marine terminal (USDI, MMS, 1984b).

Previous exploratory activity in the AEA area has been supported by existing facilities and has not required significant expansion of any onshore support bases (refer to Table III-18). Temporary structures have, on occasion, been moved into a base area to serve as an office and living quarters for onshore personnel. Existing resources have been adequate in the past for these temporary facilities.

Additional site-specific information relative to the impacts of expanded or new support facilities will be addressed in an SEA, if applicable.

4. Impacts of Public Opinion

No significant public opposition to exploratory activity in this socioeconomic area has been expressed. Increased exploration activity would be expected to ellicit a favorable public response. Public opinion in the West Florida area indicates a 79% figure for support of the concept of leasing of offshore lands for oil and gas (USDI, MMS, 1984b). Therefore, no impacts to the exploratory operations in the AEA area are expected.

Table IV-8

Siting Considerations and Potential Pollutants from OCS Oil and Gas Development and Onshore Service Bases

Categories or Elements		Economic Requirements/Pollutants
Siting considerations		
Land	Temporary base	2-6 ha (5-15 acres)
	Permanent base	10-40 ha (25-100 acres)
Berthage		61-183m (200-600 ft) water frontage 5-6m (15-20 ft) water depth
Transportation		Air-heliport very close proximity Water-excellent vessel accessibility Rail-desirable Road-adequate accessibility
Economic		Cost of land Proximity to related industries
Economic base		
Labor		50-60 jobs/platform during drilling 20-30 jobs/platform during production
Wages		$750,000-$1,000,000/year
Capital investment		Temporary base-$200,000-$300,000 Permanent base-$2 million-$5 million
Type of pollution		
Air emission		Hydrocarbons Carbon monoxide Nitrogen oxides
Wastewater contaminants		Hydrocarbons Heavy metals
Solid Wastes		Up to 6 tons per day during drilling Hazardous wastes
Noise		Up to 100 dBA on a 24-hour basis (measure of the intensity of sound)

Source: French and Parsons, 1983.

Table IV-9

Siting Considerations and Potential Pollution from Berthing Facilities

Categories or Elements	Economic Requirements/Pollutants
Siting considerations	
Land	
Terminal	20-30 ha (50-75 acres)
Tank farm	8-30 ha (20-75 acres)
Berthage	Approximately 304m (1,000 ft) for pier
Water	Potable water Purging
Economic base	
Labor	25-75 jobs
Wages	$500,000-$1,000,000/year
Capital investment	$15-$50 million
Pollution sources	
Air emissions	Hydrocarbons Carbon monoxide
Wastewater contaminants	Oil and grease High BOD (Biochemical oxygen demand) High COD (Chemical oxygen demand)

Source: French and Parsons, 1983.

5. Impacts on Navigation

Crew and workboat operations between onshore support bases and offshore rigs will result increased marine traffic in the assessment area. Increases in traffic could result in congestion in certain areas and possible collisions, which could result in personal injury. At night or during rough weather, fog, or heavy seas, ships not using established fairways could collide with an exploratory drilling rig. However, significant impacts to shipping are not expected due to the temporary nature of the drilling rigs. As a positive impact, offshore structures may serve as navigational aids and areas of safety for small boat operators during storms (USDI, BLM, 1978).

6. Impacts Concerning Military Use

This entire offshore area is used extensively by the Air Force (see Figure III-8) for conducting military training, testing and research activities. The nature of military operations dictate that some exploratory activity may have to be delayed on some occasions. In order to promote a compatible joint usage of an area, negotiations between the Department of the Interior and the Department of Defense have resulted in a memorandum of understanding between the two. The Memorandum of Agreement (1983) between the Department of Defense and the Department of the Interior establishes procedures for resolving all conflicts prior to any offshore activity (Appendix 2). As part of the mitigating measures required for exploration activities, Stipulation No. 5 regulates the timing of placement and location of surface structures, as well as planned periods of operation. An assessment of the proposed activities in relation to military warning areas is made prior to approval of each exploration plan and appropriate mitigation measures are appended. Application to implement approved exploration palns through the Application for Permit to Drill process will serve as the basis for approving the location and density of surface structures. Additionally, all lessees should take precaution in drilling and locating any structures within or near the explosives dumping areas identified on Figure III-8 due to the presence of unexploded ordnance.

7. Impacts on Commercial Fishing

The potential cause of adverse impacts to the commercial fisheries resources from future oil and gas activities could be physical damage to the organisms and their habitats due to drilling, anchors, smothering by drilling fluids and/or cuttings and toxicity to the organisms from the drilling fluids components. While the impacts from these activities are generally quite localized in extent, the damage caused by these activities to unique and productive communities, such as coral reefs and live bottoms, may be severe.

The major environmental consequences and impacts on commercial fishing would be from drilling rigs and gear conflicts. Drilling rigs remove from 1-2 hectares (3-5 acres) of trawling space. Gear conflicts result in such losses as trawls, shrimp catch, business down time, and vessel damage. The financial losses from gear conflicts are theoretically covered by the Fishermen's Contingency Fund; seven claims have been submitted since inception of this fund in January 1979 off the State of Florida and five of those were settled for a total of $35,000 (Jackson, 1985, personal communication).

Commercial fishery resources could also be adversely affected by the discharge of drilling muds. Drilling muds contain materials toxic to marine fishes. Dilution is extremely rapid in offshore waters to the extent that every substance measured in the water column reached background level at a distance of 2,000m (6,562 ft) [probably within 1,000m (3,281 ft)] of the discharge point (Ecomar, Inc., 1980). The construction of navigation channels and onshore support facilities may alter salinity regimes and water current patterns and contribute to wetland/seagrass loss which in turn could have a negative impact on the fishery resources. Oil spill impacts to commercial fishing are addressed in Section IV.A.4. Refer to Section IV.C.8. of this AEA for a discussion of the beneficial impacts from exploration activity on recreational fishing.

8. Impacts on Recreation/Tourism

Potential impacts to recreational resources in the AEA area from exploratory activity are largely limited to oil spills. The level of shoreline recreational use is expected to be unaffected unless obvious and extensive oil pollutants impact the shoreline. Oil spill impacts to recreational resources, activities, and tourism are discussed in Section IV.A.4. of this AEA.

The aesthetics of the AEA coastal area utilized for recreation by both tourists and residents may be affected by the presence of some nearshore lease site activities that are visible from portions of the shoreline. Impacts to a few shoreline recreational areas could result from trash, debris, noise, and wakes from oil and gas related transportation support needs such as crew boats, supply boats, and helicopters. Expanded and continuous development in the central and western Gulf has contributed to serious chronic debris wash-up problems at some shorefront parks in Louisiana and Texas; therefore, it is likely that these impacts could also occur in the eastern Gulf (USDI, BLM, 1980). Increased crew boat traffic could possibly contribute to marsh loss within the AEA coastal area. Continued marsh loss and wetland deterioration would consequently cause waterfowl, hunting, and fishing opportunities to decline (USDI, BLM, 1981).

The aesthetics of the AEA offshore area utilized by recreationists (i.e., divers, sport fishermen) may be affected by the presence of visible lease site activities. However, the presence of these oil and gas structures could also offer these visitors positive impacts by serving as navigational aids to the site and by offering refuge and emergency assistance to boats in distress. In addition, positive impacts to fishing opportunities are brought about through oil and gas activity in that oil and gas structures are known to attract fish and inevitably fishermen. Many of the fish species that congregate around petroleum structures are prime sport fishing targets (snapper, grouper, mackerels, cobia, etc.); moreover, it is possible to predict the location of desired species by associating drilling structures with major depth zones. Since previous studies have determined that oil and gas structures are the most popular offshore fishing locations for private and charter boat fishermen in portions of the western and central Gulf it is likely that this would hold true for the eastern Gulf. The degree to which oil and gas structures acting as artificial reefs would affect recreational fishing is believed to be related to the number and size of structures, the length of time they are in place, and their distance from shore and principal access areas. Water depth, oceanic conditions, and bottom types should also affect fishing potential associated with petroleum structures (USDI, MMS, 1983a).

Anchoring in the vicinity of the scattered reefal areas could cause long lasting visible damage which would detract from the live bottom area's aesthetic appeal for divers. Although the anchoring of other vessels, such as fishing boats, cannot be regulated by MMS, regulations for the implementation of the Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic (50 CFR 638, as amended July 23, 1984) do restrict damage (including anchoring) to specific prohibited coral on these reefal areas. The FREIS provides further discussion of impacts to recreational resources and tourism from oil and gas related activities (USDI, MMS, 1983a).

9. Impacts on Cultural Resources

The potential destruction of unique archaeological data on the OCS from oil and gas exploration has been raised as a significant issue by many government agencies, institutions, and professional archaeological groups.

Since, in any archaeological site, some of the most important information is contained in the horizontal and vertical position of an artifact or cultural feature, in relation to other cultural objects or the natural environment, any activity which disturbs that context destroys potentially valuable archaeological data.

The major impact producing factors would be those threatening direct physical destruction or alteration of sites or site components, including the placement of exploratory rigs. This activity would also result in tons of new ferromagnetic structures and debris offshore which would tend to mask magnetic signatures of significant cultural resources, should future surveys be attempted, new or expanded. Onshore support facilities would also have the potential for directly impacting sites through physical alteration or destruction of site components.

Historic - Shipwrecks located on the OCS would have to be assessed individually to determine their uniqueness and the amount of information they might provide to our nation's maritime heritage.

Onshore historic sites would also have to be assessed individually to determine the uniqueness or importance of the data they contain. However, sites already listed on the National Register of Historic Places, and those considered eligible for the Register have already been evaluated as being able to make a unique or significant contribution to science.

Due to the visibility of most onshore historic sites and State and Federal cultural resources laws which require consideration of historic properties if any State or Federal funding or permits are required for construction, it is unlikely that there would be an interaction between an impact producing factor and a significant historic resource as a result of any projected onshore development. It is also possible that the type of information available from most coastal historic sites can also be obtained from historic records or other coastal historic sites.

Prehistoric - Any in situ prehistoric sites located in the AEA area would be unique at this point in time. As more sites are discovered, those along relict shorelines, seaward of about the 20m (66 ft) isobath, will provide unique archaeological data on coastal adaptations prior to the Late Archaic period. Such information is unavailable from terrestrial sites in North America because coastal areas for all cultural periods prior to the Late Archaic are currently submerged on our continental shelves. Archaeological data on prehistoric migrations, settlement patterns, and cultural contacts across now submerged land masses is also information which can only be obtained from submerged sites on the OCS.

Onshore prehistoric sites would have to be assessed individually to determine the uniqueness or importance of the data they contain. However, sites already listed on the National Register of Historic Places, and those considered eligible for the Register, have already been evaluated as being able to make a unique or significant contribution to science.

Conclusion - Due to the general lack of a data base for OCS cultural resources, the expected impact from offshore exploration is uncertain. Based on a conditional analysis of impacts to cultural resources by any projected oil and gas exploration activities in the eastern Gulf, the potential for a significant impact to historic resources would be either very low or moderate (depending on the uniqueness of the data lost), and to prehistoric resources would be moderate (assuming that any data lost would be unique) (USDI, MMS, 1984b).

The potential impacts to both historic and prehistoric sites from new or expanded onshore support facilities and oil spills are considered to be very low.

Impacts to specific cultural resources will be assessed and mitigation will be developed in the SEA based on the findings of the high-resolution remote sensing surveys and cultural resource reports for a specific lease and POE and MMS reviews of those reports.

10. Impacts on Other Commercial Uses

There are no other known commercial uses in the area to be affected by oil and gas exploration activities.

11. Impacts on Other Mineral Uses

At present, there are no further plans or proposals for the mining of mineral resources other than oil and gas in the AEA area; therefore, no conflict of use is expected to result from the proposed exploration activity.

12. Impacts Concerning Pipelines and Cables

Offshore oil and gas pipelines are considered impact-producing factors of special concern on the basis of potential space/use conflicts, disturbance of bottom sediments, accidental oil spills, and other environmental perturbations. There is no record of existing pipelines or cables in this area of the Gulf of Mexico; therefore, no conflicts with proposed exploration activity are expected.

13. Impacts of Ocean Dumping

The sole EPA-approved deep water disposal area in the Gulf of Mexico is located almost due south of the Texas/Louisiana border. At the time of this writing, the MMS does not anticipate that any permitting agency will issue permits for dump sites in or adjacent to the AEA area. Therefore, it is unlikely that impacts associated with ocean dumping will affect or be affected by oil and gas exploration activities within the AEA area.

D. UNAVOIDABLE ADVERSE IMPACTS

Localized and short-termed impacts would be expected to result from exploration activity in the AEA area. Most of these impacts would not be considered to be irreversible.

Ambient air quality in the vicinity of a drilling rig would be degraded by operation-induced emissions. Although emissions, in varying quantities at intermittent intervals, could be generated during drilling operations, the extent of the area affected would be localized since the prevailing climatic conditions would dilute and disperse the pollutants. Non-combustible gas blowouts and combustible oil blowouts could also adversely affect the air quality in the vicinity of the drilling operations, with the degree of air quality degradation being determined by the quantity of pollutants emitted, the duration of the blowout, and the prevailing climatic conditions. The minor emissions produced by marine vessels and helicopters should not have any significant effect on the onshore air quality.

Rig installation and the discharge of drill cuttings and muds may alter or degrade the water quality by resuspension of sediments and the release of entrapped pollutants into the water column. Normally, these activities have localized effects with short-termed persistency because of the dilution effects of a water body the size of the Gulf of Mexico. Discharges of treated liquid waste and concentrated seawater would also be rapidly diluted to background levels; therefore, no significant water quality degradation is expected to result from exploration activity.

Bottom disturbances and turbidity plumes induced by installation of the drilling rig and the discharge of drill cuttings and muds should have localized short-termed effects on marine organisms. Benthic communities occupying disturbed areas would suffer direct and indirect mortality. Long-term effects would only result from introduction of material differing in chemical and physical makeup which could alter the composition of the recolonized benthic community. The turbidity plumes induced by the various activities could reduce the photosynthetic assimilation of the phytoplankton populations inhabiting the area. Zooplankton may be adversely impacted by clogging of the filter feeding mechanisms or by blocking the respiratory surfaces. Plankton populations would be subjected to intermittent losses in the vicinity of a drilling site during drilling. Since a proposed exploratory action is a short-term activity with localized effects, no significant long-term losses of marine resources would be expected.

The proposed drilling activity has the potential to induce a conflict of uses for the area involved. The area occupied by a rig, 1-2 hectares (2-5 acres), will be unavailable for trawling operations for the duration of drilling at one well site. Although this is recognized as an adverse impact, the degree and extent of the effect is unknown. There are no data available to indicate that OCS oil and gas operations are responsible for declines in catches. There also exists a potential of boat collisions with a drilling rig; however, this is unquantifiable. A 30 square mile area surrounding the exploration activities would be unavailable for military use throughout the duration of oil and gas activities.

Blowouts, oil spills, and other types of accidents have the potential to severely affect human life or health and the indigenous natural resources and associated activities and uses. The degree and duration of such effects would be dependent upon the severity of the accident (oil spill), the location, the season, the resources affected, etc.; therefore, it is not possible to predict the effects of an oil spill with any degree of certainty.

Presently unknown and undiscovered cultural resources could also be adversely impacted by proposed offshore exploration activities.

V. CONSULTATION AND COORDINATION

This section will be addressed in an SEA.

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VIII. APPENDICES

APPENDIX 1 - Endangered and Threatened Species Biological Opinions

APPENDIX 2 - Memorandum of Agreement, Departments of Defense and Interior

The following appendices will be included in an SEA as appropriate:

APPENDIX A - Lease Stipulations

APPENDIX B - Cultural Resource Report(s)

APPENDIX C - Reviews from MMS

APPENDIX D - Review from Other Agencies

APPENDIX E - Non Proprietary Copy of POE, SER, AER, and Live/Hard Bottoms Survey Report

APPENDIX 1 - Endangered and Threatened Species Biological Opinions

United States Department of the Interior
FISH AND WILDLIFE SERVICE
75 SPRING STREET, S.W.
ATLANTA, GEORGIA 30303

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April 9, 1984

MEMORANDUM

TO: Director, Minerals Management Service, Reston, Virginia

FROM: Acting Regional Director, FWS, Atlanta, Georgia (AFA/SE)

SUBJECT: Section 7 Consultation on Outer Continental Shelf Oil and Gas Leasing and Exploration in the Gulf of Mexico

We have reviewed the information that was provided for Outer Continental Shelf (OCS) leasing sales numbers 81, 94, 98, and 102. We concur that these sales do not represent a substantive modification of the proposal actions considered in earlier regionwide consultations. Biological Opinions were issued on the regionwide consultations on April 10, 1979; June 30, 1982; and the October 25, 1982 amendment to the June 30, 1982 opinion.

Therefore, we concur that formal consultation for these sales need not be initiated at this time. However, the Minerals Management Service is reminded that formal Section 7 consultation must be initiated if new information reveals impacts on listed species or their habitats for these OCS sales that were not considered in this review, if these proposed OCS sales are subsequently modified, or if a new species is listed or critical habitat is designated which may be affected by these proposed OCS sales.

David B. Allen

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

ADDRESS ONLY THE DIRECTOR,
FISH AND WILDLIFE SERVICE

In Reply Refer To:
FWS/OES

OCT 25 1982

MEMORANDUM

To: Director, Minerals Management Service

From: Chief, Office of Endangered Species

Subject: Amendment to the June 30, 1982, Biological Opinion for the Lease and Exploration of Outer Continental Shelf Lands in the Gulf of Mexico Region

Following completion of the biological opinion of June 30, 1982, we received comments from within the Fish and Wildlife Service pointing out that we may have been overly generous and incorrect in our interpretation of some results contained in a draft report on the Effects of Petroleum on the Development and Survival of Marine Turtle Embryos by Fritts and McGehee. After reviewing these comments and the final report on this subject, we feel this constitutes new information on a listed species sufficient to justify an amendment to our June 30, 1982, biological opinion. Therefore, attached you will find an amended biological opinion for the Lease and Exploration of the Outer Continental Shelf Land in the Gulf of Mexico Region which supercedes the opinion of June 30, 1982.

Although the major change in this amended opinion relates to the comments on sea turtles, several other changes and additions have been made for purposes of emphasis, most particularly to emphasize an existing concern for potential impacts on the American crocodile. Nevertheless, the final opinion in this amended version remains the same as in the June 30, 1982, biological opinion. All additions are identified by being enclosed in brackets. Deletions are relatively few, and consist largely of the general comments on sea turtles, but others can be determined by cross-checking with the original opinion (paragraphs one and three on Page 2 of this version are the next largest deletion).

If you have any questions, please contact Wayne Milstead in this office (phone FTS 235-2760).

Attachment

United States Department of the Interior

ADDRESS ONLY THE DIRECTOR,
FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OES MMS-82-1

OCT 25 1982

MEMORANDUM

To: Director, Minerals Management Service

From: Chief, Office of Endangered Species

Subject: Amended Biological Opinion for the Lease and Exploration of Outer Continental Shelf Lands in the Gulf of Mexico Region

By memorandum received November 10, 1981, the Bureau of Land Management (BLM) and the Geological Survey (GS), now a part of the Minerals Management Service (MMS), requested the reinitiation of formal consultation with the U.S. Fish and Wildlife Service (FWS) under Section 7(a) of the Endangered Species Act to consider all of the operations pertaining to Outer Continental Shelf (OCS) oil and gas leasing and exploration in the Gulf of Mexico OCS Planning Area.

An original Section 7 consultation on the lease and exploration of OCS lands in this area occurred in 1979 with a biological opinion being rendered to BLM and GS April 10, 1979 (copy attached). Consultation was reinitiated on the basis of an extension of the boundaries of the Gulf Region as well as on an oilspill analysis for the Region.

A consultation team consisting of Wayne Milstead, Office of Endangered Species (OES), Team Leader; Bob Cooke, FWS, Region 4 Office, Atlanta, Georgia; and Jim Barkuloo, FWS, Panama City, Florida, was appointed and attended a meeting with representatives of MMS in New Orleans on December 2-3, 1981. The consultation team requested information on any new potential onshore facilities in the Region and an analysis of the probability of oilspills occurring as a result of the action. Since the information was not forthcoming and the 90-day period for consultation had run out, a memorandum was sent to MMS on March 4, 1982, requesting that formal consultation be delayed until the information requested was made available. On March 13, 1982, the information requested was received from MMS, but as a result of subsequent conversations with MMS personnel it was discovered that the oilspill analysis had been revised. Final, up-to-date oilspill information was received in OES on April 13, 1982, at which time the formal consultation period was resumed.

[Following submission of a biological opinion on June 30, 1982, the FWS felt that new information received on the potential impacts of this project on listed species was sufficient to necessitate a revision, resulting in this amended version.]

The following listed Endangered or Threatened species were considered during this consultation as being potentially affected by the action: bald eagle (Haliaeetus leucocephalus), brown pelican (Pelecanus occidentalis), loggerhead sea turtle (Caretta caretta), Kemp's (=Atlantic) Ridley sea turtle (Lepidochelys kempii), West Indian (Florida) manatee (Trichechus manatus) and its Critical Habitat, [American crocodile (Crocodylus acutus) and its Critical Habitat,] and whooping crane (Grus americana) and its Critical Habitat. [The status of other species included in the April 10, 1979, biological opinion has not changed substantially. The extension of the lease area and the oilspill risk analysis will not result in changes in the 1979 opinion for these species.]

The Gulf area involved in this consultation includes the outer continental shelf lands not presently under lease that are north of a line running east from approximately the U.S.-Mexican border on the coast at 26 degrees north latitude to 88 degrees west longitude where it jogs north 1 degree latitude, then east again 2 degrees west longitude to 86 degrees west longitude with another diversion south 2 degrees latitude to 25 degrees north latitude and finally east toward the Florida coast until a final jog north along 82 west degrees longitude intersects the Florida coast just south of Charlotte Harbor (Figure 1). This consultation considers the effect of all activities associated with the lease and exploration of lands within this area on listed Endangered and Threatened species under the jurisdiction of the FWS.

[A major change which brought about the reinitiation of the previous consultation was the addition of a "frontier" lease area off southwest Florida between 26 degrees and 25 degrees north latitude. In addition, new information on Gulf-wide OCS activities was provided in the form of an oilspill risk analysis for the development/production phase in the region. This opinion, therefore, concentrates on those species which are within or adjacent to this "frontier" area. Comments will generally reference the previous biological opinion of April 10, 1979, and the statements in that opinion stand unless new information necessitates additional comment or allows a change in any part of that opinion.]

Exploration of the OCS requires certain onshore facilities that might include office space, helicopter and fixed-wing aircraft facilities, boat docks, and support bases. There is an extensive history of intensive oil and gas activity in the Gulf of Mexico, and numerous onshore facilities have been established throughout the Region. The availability and necessity of onshore facilities appears to remain as they were at the time of our April 10, 1979, biological opinion, and it would seem unlikely that additional lease and exploration of the OCS in the Gulf Region will result in the development of additional onshore support facilities. Should the use of existing facilities be changed or additional onshore facilities be needed which may affect listed species or their habitats, consultation must be reinitiated.

Although not available for the 1979 consultation, an oilspill risk analysis has been provided for this reinitiation. It gives the percent probability that one or more spills of 1000 barrels or more will occur, from a variety of sources, during the life of the project and that they will strike various targets and/or land segments along the Gulf Coast within 3, 10, or 30 days after initiation of the spill. This analysis is based on activities that can be expected to be associated with the development and production phases of the project following lease and exploration, and this consultation is on the lease and exploration phases only. Probabilities are broken down into spills expected to result from three cumulative categories of events: (1) the proposed lease sale only, (2) the proposed sale plus existing leased OCS lands, and (3) the proposed sale plus existing leased lands, as well as oil imports moving through the lease area. The life of the proposal is considered to be 40 years. If the third category of events leading to oilspills that will strike various targets within 30 days (proposed sale, existing activities, and imported oil) is considered the worst case situation, some figures are very high. This is particularly true of land segments in the western Gulf where probabilities from the proposed lease alone are from 13 percent at Aransas County, Texas (whooping crane wintering range), to 67 percent at Saint Bernard Parish, Louisiana (a brown pelican nesting site); and if existing leased lands plus imported oil are included, these figures increase respectively to 51 percent and 93 percent.

Although the general statements and considerations provided for each species in the 1979 biological opinion are still appropriate, [the addition of a "frontier" area and] the introduction of oilspill data necessitates an additional consideration of potential impacts on some species. [The West Indian manatee, American crocodile, brown pelican, and loggerhead sea turtle are the species most likely to be impacted as a result of the extended lease area. Other limited species are considered here because of the potential for impacts as oil and gas activities increase throughout the Region.]

Bald Eagle (Haliaeetus leucocephalus)

The discussion in the 1979 biological opinion regarding the possible contamination of the bald eagle's food source by an oilspill is emphasized by the high probabilities of such spills reaching segments of the Texas and Louisiana coast in reasonable proximity to bald eagle nesting territories. It can be expected that bald eagles might be attracted to the area of a spill by dead and dying fish and birds as a food source and thereby consume oil adhering to prey species. Nevertheless, evidence from other species of birds suggests that adult birds may be able to tolerate the ingestion of fairly high concentrations of crude oil. Also, the direct effect of oil on plumage is perhaps not as significant a factor with bald eagles since adults, at least, tend to have minimal contact with the water from which they are taking prey.

However, the more important adverse impact of an oilspill on bald eagles would probably be on reproduction through contamination of eggs from adults carrying oil on breast feathers and feet.

Nesting territories are found in or near Refugio (land segment 6), Calhoun (land segment 7), Matagorda (land segment 8), and Brazoria (land segment 9) Counties, Texas, and the relatively high probabilities of oilspills striking these areas (13 percent, 24 percent, 45 percent, and 32 percent respectively) are of concern. Similarly, active bald eagle nesting in the Mississippi delta region of Louisiana from land segments 16 to 21, along with associated oilspill probabilities of 54 percent, 40 percent, 17 percent, 86 percent, 67 percent, and 31 percent respectively suggests a high level of threat to the recoverability of the species in the western Gulf Region. [The status of this species in the eastern and central Gulf Regions is essentially the same as discussed in the 1979 biological opinion.]

Brown Pelican (Pelecanus occidentalis)

Few brown pelican nesting sites remain in the western Gulf of Mexico. Three sites exist along the Texas coast, Pelican Island, Nueces County (land segment 5), and Second Chain of Island and Sundown Island, Calhoun County (land segment 7). Also, pelicans range over much of the Texas coast from land segment 4 (Kleberg County) north to land segment 8 (Matagorda County). Probabilities of oilspills resulting from the proposed sale striking land segments 5, 6, and 7 are 22 percent, 13 percent, and 24 percent respectively. These figures are increased to 44 percent, 51 percent, and 61 percent when oil from existing leased OCS lands and oil imports are included as a factor.

In Louisiana, only two small restored nesting colonies exist, one on Queen Bess Island, Jefferson Parish (land segment 18) and the other on North Island, Saint Bernard Parish (land segment 20). The probability of oilspills from the proposed lease activity striking these two segments is 17 percent and 67 percent respectively.

When the effects of existing leased OCS lands and imported oil is included, these probabilities increase to 69 percent and 93 percent. Such high values nearly assure that one or both of these two fragile nesting sites will be affected by one or more oilspills of 1000 barrels or more within 30 days after release over the 40 years of the project. Even though all these island nesting sites in Texas, as well as in Louisiana, might be partially protected from the direct impact of an oilspill in the open Gulf by seaward barrier islands, the wide-ranging nature of the birds when foraging would amplify the possibility of oil contamination. The most damaging effect of oil contamination on brown pelicans would be on reproduction. Due to the bird's feeding habits, it is reasonable to assume that adult brown pelicans might in fact avoid feeding in oiled waters because of the difficulty of their observing fish beneath the surface. But very small amounts of certain crude and refined oils applied to the surface of eggs cause high embryonic mortality or morphological abnormalities in a variety of avian species. If spills occurred during the nesting season of the brown pelican, oil can be transferred to eggs from feathers or feet of adults resulting in reduction in hatching rate. As with bald eagles, the impact of oilspills on the recoverability of brown pelicans in the Texas-Louisiana coastal region could be substantial. [The status of the brown pelican in the eastern Gulf Region is essentially the same as discussed in the 1979 biological opinion.]

Whooping Crane (Grus americana)

The wintering range of the entire reproducing wild population of the whooping crane exists along a stretch of Texas coast, including a portion of the Critical Habitat (Aransas, Calhoun, and Matagorda Counties), subject to probabilities of being impacted by one or more substantial oilspills of 13 percent, 24 percent, and 45 percent during the life of the proposed lease of these OCS lands. These figures increase to 51 percent, 61 percent, and 86 percent when activities on existing leased lands plus imported oil are added to the oilspill analysis.

These birds feed largely on crabs and clams in tidal flats and shallow bays and channels while wading, and oiled waters in these habitats could pose a considerable threat if a spill occurred between November and late April when the cranes are on their wintering grounds. Again, as with brown pelican nesting sites, this wintering habitat of whooping cranes is protected to some extent from oilspills in the open Gulf by barrier islands, but the loss of even a relatively small portion of a population, estimated to consist of approximately 75 individuals, could have a drastic impact on the continued existence of the species.

Sea Turtles

[Recent studies on the effects of petroleum on the development and survival of marine turtle embryos are inconclusive. The results of these studies indicate that oil remaining on the beach approximately one year after a spill did not cause significant mortality in sea turtle eggs, however, fresh crude oil deposited on top of sand can cause extensive mortality to incubating sea turtle eggs. More definitive information is needed to assess impacts of oiling on sea turtle nesting beaches.]

Loggerhead Sea Turtle - (Caretta caretta)

Loggerhead sea turtles nest on several barrier islands along the Gulf coast, in some cases in considerable numbers. The probabilities of an oilspill from all potential sources striking some areas of known loggerhead nesting sites within 30 days are relatively high. For instance, the figures for the Chandeleur Islands, Louisiana (segment 20), has a probability from all sources of 93 percent and Santa Rose Island, Florida (segment 24), has a probability of 36 percent. [The probability of oil reaching nesting beaches in the "frontier" lease area off Florida as a result of OCS leasing and exploration is near zero.]

Kemp's (=Atlantic) Ridley Sea Turtle - (Lepidochelys kempii)

Except for purported occassional nestings along the southern Texas coast, this species nests entirely along an approximately 14-mile stretch of Mexican coast.

Since 1978, the U.S. Fish and Wildlife Service has been involved in a project designed to return these turtles to nesting sites in the U.S. Eggs are collected in Mexico, transported to Padre Island National Seashore, and placed in artificial nests. After hatchlings move from these nests into the water, they are recaptured and raised in "head start" facilities until they are mature enough to be released into the Gulf. It is hoped that this procedure will result in turtles that are imprinted on Padre Island as a nesting site, and that they will return there when sexually mature at approximately 7 years of age. [The impacts of a fresh oilspill on nesting stages of the species would probably be significant if the oil hit the beaches during the nesting season.] The probability of a 1000 barrel or more oilspill striking some part of Padre Island within 30 days of its inception from the proposed sale only ranges from 5 percent to 19 percent, and when present activities are added these climb to 8 percent to 33 percent. Such probability figures are high enough to warrant concern.

West Indian (Florida) Manatee - (Trichechus manatus)

The manatee is confined to shallow coastal waters, bays, rivers, and inlets along both coasts of Florida, portions of which are designated as Critical Habitat. The probabilities of one or more oilspills of 1000 barrels or more occurring and striking coastal areas within the range of the manatee on the west coast of Florida within 30 days of release is 6 percent. For any one land segment in manatee range, the highest probability, 3 percent, is found adjacent to the Tampa Bay area. On the basis of this information, it would appear that oiling should not pose much of a threat to the manatee.

Boat traffic has been and remains a major threat to the species, and this was the primary topic of concern in the biological opinion of 1979. In this case, the potential hazard from boat traffic would of course derive from any additional boating activities associated with the lease and subsequent exploration for petroleum in the Gulf OCS.

[American crocodile (Crocodylus acutus)

The extension of the OCS lease area south to 25 degrees north latitude offshore Florida increases the potential for disturbance and impact on the crocodile. The lower Keys population within the National Key Deer Refuge would be within 20 nautical miles of the nearest lease tract offered. The nearest documented nesting population to the lease areas is located within Everglades National Park, approximately 30 nautical miles from the nearest lease tract. The oilspill risk analysis shows a 1 percent probability of oil reaching land in land segment 43 within 30 days, but the probability of it reaching Everglades National Park was less than 0.5 percent. Since the possibility of an oilspill is even less during exploration, and no new onshore facilities are anticipated, the April 10, 1979, biological opinion for the American crocodile is still valid. This includes the provision that "any development/production activities in or near the Cape Sable/Florida Bay area will require Section 7 consultation. At that time, further information will be necessary to determine the effect on the American crocodile. This information should include site specific transportation methods to be used, location of all onshore facilities associated with OCS activities, an oilspill trajectory study including current direction/velocity information, and other pertinent information." Although an oilspill risk analysis is now available, there may be a need for more site specific or refined information on oilspill trajectories in case of development/production.]

Conclusion, Advisory Statement, and Cumulative Effects

There are two areas of concern when considering potential affects of leasing and exploring OCS lands in the Gulf of Mexico on Endangered or Threatened species. One is the development of onshore facilities that are either support bases directly associated with exploration activities or marine terminals, refineries, gas processing plants, pipelines, etc. that are associated with subsequent development and production activities. Second is the chance that, if discoveries are sufficient and production occurs, oilspills of significant size may occur and impact listed species and/or their habitats.

In your memorandum of March 11, 1982, you stated that the existing support base at Port Manatee, Florida, is the most likely one to be used, but there is a 5 percent to 10 percent probability that Boca Grande or Key West, Florida, could be used as support bases. We take this to mean that no new support bases will be required for exploration activities resulting from the lease of OCS lands in the Gulf Region covered by this consultation, with the exception of the slight chance that Boca Grande and Key West might be used. Furthemore, it is assumed that all other types of facilities mentioned in this memorandum will be required only if development and production result from exploration in this Region.

It is also understood that the oilspill analysis provided for this consultation pertains only to the development and production phases on lands to be leased in the Region, plus the background of existing production along with the contributory effect of oil imported into the Gulf of Mexico. Therefore, as long as leasing and exploration activities utilize only existing onshore support facilities in the Gulf Region (not to include the use of Boca Grande and Key West, Florida), and as long as the probability of oilspills (of a magnitude large enough to be included in the oilspill analysis) occurring during the exploration phase is essentially zero, then it is my biological opinion that these activities are not likely to jeopardize the continued existence of the bald eagle, the brown pelican, the whooping crane, the loggerhead sea turtle, the Kemp's (=Atlantic) Ridley sea turtle, [the American crocodile,] and the West Indian (Florida) manatee or result in the destruction or adverse modification of the Critical Habitat of the whooping crane, [the American crocodile,] and the Florida manatee. However, should any additional onshore facilities be established along the Gulf Coast in support of exploration activities, particularly south of Tampa Bay, Florida (Port Manatee), then formal Section 7 consultation must be reinitiated. Such a request for consultation must include the following information:

(a) Location of the port to be used for operation;

(b) Routes or channels to be used by the vessels or aircraft and the relationships between these routes and listed species habitat or migration routes;

(c) Description of vessels to be used for support of OCS operations (design, speed, draft, and other pertinent information);

(d) Determinations of whether the vessels used for OCS oil and gas operations would have characteristics which would be more detrimental to manatees than those currently used in manatee habitat.

[(e) Refinement and update of oilspill risk analysis, with emphasis on southwest Florida.]

Even though the probability of one or more oilspills occurring and striking the southwest Florida coast is very small, our concern over the fragile nature of the Florida Bay area expressed in our April 1979 biological opinion continues. In this regard, we reiterate our statement about consulting on the establishment of any support bases along the coast south of Tampa Bay, Florida. We also advise extreme caution when considering any development plans that might feasibly contribute to an increased danger of oilspills in this south Florida area.

We also strongly recommend an investigation into the possible fate of oil from a spill once it is carried out of the Gulf around the southern tip of Florida by the Loop Current. Depending on the location of a spill and the existence and combination of wind and sea currents, it seems possible that oil from the Gulf might end up being deposited on the east coast of Florida under certain conditions.

In this opinion we have endeavored to address the direct (leasing and exploration of OCS lands) and indirect (oilspills and support facilities resulting from exploration) effects of the action as well as the interrelated (development and production phases, along with potential oilspills of the OCS program) and interdependent (pipelines, marine terminals, refinery, gas processing facilities, etc. that could result from development and production) aspects of the action. We have concluded that the direct and indirect actions are not likely to jeopardize the continued existence of the above listed species or result in the destruction or adverse modification of their Critical Habitats if the probability of oilspills from exploration are considered to be near zero and as long as existing support bases are sufficient to handle anticipated exploration activities. Consultation must be reinitiated if indirect actions (especially a need for new support bases) change or, if the interrelated and interdependent activities of development and production commence.

There remains for consideration, the cumulative effects of State and private actions in the Gulf Region that are reasonably certain to occur prior to completion of the Federal action which is the subject of this consultation. Since no specific information on such actions has been provided us by the Federal action agency to date, we reserve the right to make a supplementary comment on the potential effects of these projects (cumulative effects) after receiving a copy of the draft Environmental Impact Statement on this project.

The Minerals Management Service is reminded that Section 7 consultation must be reinitiated if new information reveals impacts on listed species or their habitats from this Federal project that were not considered in this opinion, if the proposed project is subsequently modified, or if a new species is listed or Critical Habitat is designated which may be affected by the proposed actions.

Attachment

Reference

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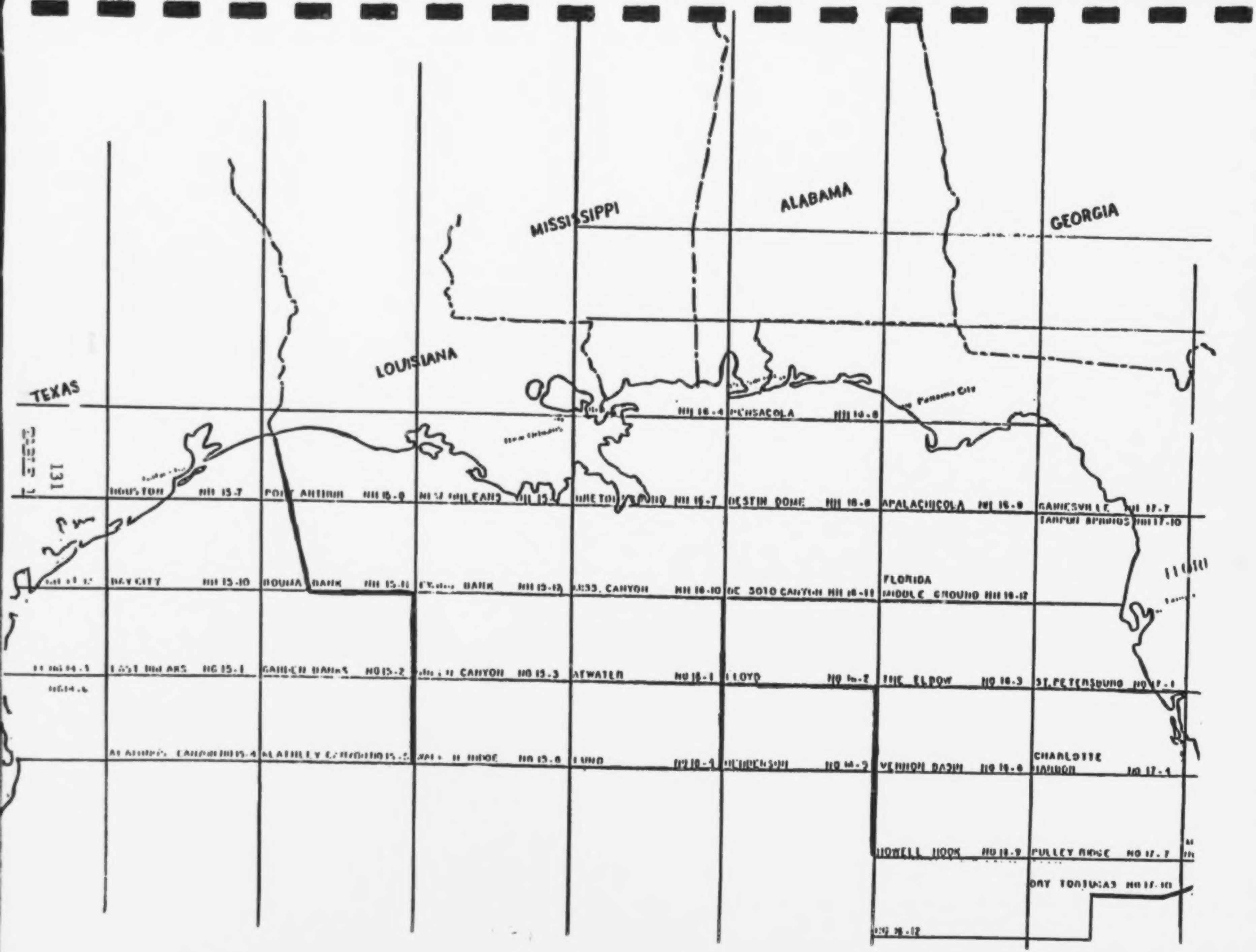
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PULLEY RIDGE NG 17-7
DRY TORTUGAS NG 17-10
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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Washington, D.C. 20235

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RESTON, VA

Mr. William D. Bettenberg
Director
Department of the Interior
Minerals Management Service
Reston, Virginia 22091

Dear Mr. Bettenberg:

This is in response to your letter of March 6, 1984, regarding Section 7 consultation for the proposed 1985 Outer Continental Shelf (OCS) lease sale Nos. 94, 98, and 102 in the Gulf of Mexico.

The National Marine Fisheries Service (NMFS) agrees that the proposed lease sales do not present a substantive modification of the proposal considered in our previous consultation on potential effects of OCS leasing and exploration on endangered and threatened species in this region. No significant new information has become available which would alter the conclusions reached in our previous biological opinion (March 29, 1979). Therefore, the NMFS concurs with the Minerals Management Service determination that reinitiation of consultation will not be necessary for the aforementioned lease sales.

The NMFS takes this opportunity to express a continuing concern for the decline of the Kemp's ridley sea turtle population. If new information concerning the numbers of or habitat use by this species becomes available, reinitiation of consultation may become necessary. Since a variety of activities occurring within the Gulf of Mexico have the potential to impact negatively on sea turtle populations, the NMFS is particularly concerned about any cumulative effects that additional projects may present.

Questions concerning this matter should be addressed to Ms. Patricia Carter, Office of Protected Species and Habitat Conservation, National Marine Fisheries Service, Washington, D.C. 20235 202/634-7471.

Sincerely yours,

William G. Gordon

William G. Gordon
Assistant Administrator
for Fisheries

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ENDANGERED SPECIES ACT

Section 7 Consultation - Threshold Examination

[illegible]es: Bureau of Land Management (BLM) and U.S. Geological Surevey (USGS)

Activity: Gulf of Mexico lease sales, exploration, transportation, termination, development and production.

Consultation Conducted by: National Marine Fisheries Service.

Results of Threshold Examination:

Under Section 7 of the Endangered Species Act of 1973 (the "Act"), as amended, each Federal agency must ensure that any action authorized, funded, or carried out by such agency does not jeopardize an endangered or threatened species. Under the Section 7 consultation process established by the Act, the Secretary of Commerce is required to provide the Federal agency concerned an opinion detailing how the proposed agency action affects any threatened or endangered species within the Department's jurisdiction or the critical habitat of such species. In addition, the Secretary must suggest reasonable and prudent alternatives which would avoid jeopardizing the continued existence of such species or adversely modifying its critical habitat and which can be undertaken by the agency in implementing its action.

By letter of November 28, 1978, the Bureau of Land Management, Department of the Interior, requested initiation of a regional Section 7 consultation with the National Marine Fisheries Service on the Outer Continental Shelf oil and gas leasing program in the Gulf of Mexico.

As part of the consultation process, a meeting was held in New Orleans, Louisiana, on February 9, 1979 with representatives of the Bureau of Land Management, the U.S. Geological Survey, and the National Marine Fisheries Service.

Formal consultation was requested for the following species:

Humpback whale	*Megaptera novaeangliae*
Right whale	*Eubalaena glacialis*
Sei whale	*Balaenoptera borealis*
Blue whale	*Balaenoptera musculus*
Finback whale	*Balaenoptera physalus*
Sperm whale	*Physeter catodon*
Leatherback turtle	*Dermochelys coriacea*
Hawksbill turtle	*Eretmochelys imbricata*

Kemp's Ridley turtle	*Lepidochelys kempii*
Green turtle	*Chelonia mydas*
Loggerhead turtle	*Caretta caretta*

Eastern Gulf of Mexico:

These Federal actions involve the offering of 116 tracts for leasing for the extraction of oil and gas. The tracts are located on the Outer Continental Shelf in areas located west, south, and east of that portion of the states of Florida, Alabama, Mississippi, and Louisiana that border on the Gulf of Mexico. The largest portion of the proposed lease offering is located off the coast of Florida.

With two exceptions, each tract contains 5,760 acres (2331.04 hectares). Tract 65-32 contains 5454.72 acres and Tract 65-71 contains 5134.56 acres.

The total area offered in all tracts amounts to 667,229.28 acres (270,023.99 hectares). The tracts are located between 10 statute miles (16 kilometers) to 119 statute miles (190 kilometers) from shore. The water depths range from 60 feet (18 meters) to 1,150 feet (350 meters). Thirty-three of the tracts are located in areas where the water depth is equal to or greater than 200 meters.

Seventy-five of the tracts proposed for offering are believed to have potential for oil and gas production, and the remaining 41 tracts are believed to be potentially oil productive.

No commercial oil and gas production has been found on the Outer Continental Shelf in this region and no marine oil and gas production has been established in this portion of the Gulf of Mexico; therefore, no facilities for the production and transportation of crude and natural gas have been installed on the Outer Continental Shelf in the vicinity of the tracts proposed for leasing.

The U.S. Geological Survey estimates that between 15 and 150 million barrels of oil and 20 - 175 billion cubic feet of natural gas may be produced as a result of this proposed sale. The production rates may be estimated at between 2,500 and 24,000 barrels of oil per day and between 4 and 32 million cubic feet of gas per day. The daily rates are estimated as rates applicable to when development is complete and production stabilizes.

A. Exploration:

Following the awarding of leases, the successful bidders can be expected to drill exploratory wells in order to locate and delineate the areal extent of oil and gas deposits. The most likely number of exploratory wells to be drilled would be 75. These wells will probably be drilled by moveable offshore drilling units.

B. Development and Production:

After the completion of exploratory drilling, platforms would be designed, constructed, and placed in position. Development wells will be drilled from platforms. The most likely number of platforms to be installed is 25, and the most likely number of development wells is 225. Underwater completions may also be utilized. Support facilities for this activity could be located in the Tampa, Panama City, or Mobile areas. The expected production life is 25 years.

C. Transportation:

The most likely method of transportation that will result from the proposed sale will be pipeline transportation of natural gas to shore points in the vicinity of existing onshore natural gas pipelines.

The most likely system for the transport of crude oil would be pipeline transport to onshore storage facilities and transportation from these terminals to existing refineries by surface marine transport. The most likely pipeline mileage that may be installed is 700 miles. Probable destination points and locations of oil terminal facilities and gas processing plants are the Manatee/Tampa area and the Mobile/Pensacola area.

A possible alternative gathering and transportation system could include the provision of offshore storage on the OCS and direct transportation from these facilities to existing refineries.

D. Termination:

Title 43, 3307.3-4 and 3307.3-6 provide for the removal of all structures when no longer required for operations. The removal must be completed within a period of one year following the expiration of the lease, and the structures must be removed to a sufficient depth beneath the surface of the waters to prevent them from being a hazard to navigation and the fishing industry.

OCS Order No. 3 requires that all casing and piling shall be severed and removed to at least 15 feet below the Gulf floor and the location shall be dragged to clear the well site of any obstructions.

This proposed action must be viewed as one part of a continuing activity that has been underway since the 1940's. Although primary emphasis has been placed on this particular sale, it should be put into the perspective of an on-going offshore oil and gas development process. As of June 23, 1977, there have been 34 OCS oil and gas (and five OCS sulfur and salt) lease sales on submerged lands in Federal areas of the Gulf of Mexico.

Currently, the Bureau of Land Management holds 495 permits on the OCS resulting in 5,862 miles of offshore pipelines. These figures are as of October 31, 1977, and exclude 12 pending applications.

As production declines in existing areas, much of the equipment, transportation facilities, and personnel can be used for new areas of activity. As existing areas of production decline, the pipelines in place can be used for new production areas, adjacent or further from shore, reducing the number of pipelines necessary to transport production from new areas to shore. This latter event has already been exercised in some areas of offshore Louisiana. Likewise, a reduction in quantity of onshore facilities, such as treatment plants, refineries, storage facilities, etc., is made possible by utilizing existing facilities, equipment, and technology.

Proposed OCS planning schedules are developed in order to project the timing, size, and location of specific sales for an OCS leasing program. The goal of the proposed schedule is to provide for orderly development of OCS oil and gas in order to maintain an adequate contribution of OCS production to the national supply and to provide early information concerning areas proposed for leasing activities.

Western and Central Gulf of Mexico:

These proposed lease sales would provide for the orderly and timely development of oil and gas reserves expected to occur on 115 tracts on the Outer Continental Shelf (OCS) in Federal waters in the Gulf of Mexico offshore of Texas, Louisiana, Mississippi and Alabama.

These tracts include approximately 545,255.24 acres and range from 3 to 165 nautical miles (6-189 kilometers) from shore in water depths of 6 to 500 meters. Approximately fifty-eight percent of these tracts are gas prone, four percent are oil prone, and thirty-eight percent are both oil and gas prone.

Surveys indicating seismic refraction, seismic reflection, gravity, magnetics, bright spot technology, and stratigraphic correlation are collected before and after leasing to assist in the determination, location, and magnitude of petroleum resources. Surface vessels of the 50 to 300 ton class are utilized to perform geophysical surveys. In general, seismic surveys record the behavior of shock waves through various rock formations. This information is used to determine the presence of salt domes, folds, faults and sediment thickness.

A. Exploration:

After a lease has been issued, shallow surveys defining geologic hazards, bottom stability, cultural resources and other conditions which might affect exploratory drill site locations are performed. Once a location has been selected, exploratory drilling begins. These drilling operations are basically the same regardless of the type of mobile rig utilized (jack-up rigs, drillships or semi-submersibles). Initially, a drive pipe is installed along with a blowout preventer. The actual drilling process involves the use of introduced muds which acts as lubricants, coolants, and pressure controls. Cuttings or a mixture of mud and drilled materials are a product of the drilling process. Sixty to 160 exploratory wells may be drilled as a result of this action.

B. Development and Production:

When petroleum discoveries are made and the extent of a field has been determined, a plan of development is devised. As a result, 10 to 25 multi-well platforms may be established with the drilling of 60 to 150 production wells.

The production phase of OCS oil and gas operations consists of bringing the product to the surface and preparing it for transport. This phase of the operation may go on for as long as 20 years. Formation waters of reservoir brines are produced in the oil and gas production process.

C. Transportation:

The principal means of getting gas and oil resources in the Gulf of Mexico from production areas offshore to processing and storage locations onshore has been and will continue to be via pipelines. Additionally, the labor force, equipment and supplies needed to service the various stages of offshore operations are transported by crewboats, barges and helicopters. As a result of this proposed action, 100 to 200 miles of new pipeline may be laid. These lines would run from new production facilities offshore and connect with the existing pipeline system to onshore facilities. It is anticipated that no new pipelines to facilities onshore will be required.

D. Termination:

When a reservoir has been depleted to a level at which it cannot produce profitably, operations are terminated. According to industry estimates, with proper placement of wells and sufficient pipeline capacity, a gas reservoir could be drained in as little as 10 years. In contrast, some oil reservoirs have been producing for over 20 years.

OCS orders issued by the U.S. Geological Survey require wells to be plugged, the casing severed adequately below the mudline, the platform removed, and all obstructions cleared from the area. Major trunklines may be used for future production from adjacent areas, but smaller lines would probably be abandoned in place. Abandonment of pipelines consists of flushing the lines of entrained hydrocarbons by water, disposing of the water onshore, and severing the ends below the mudline.

Endangered Species Impacts

Whales:

The posible impacts on whales and their critical habitat from exploratory and development/production activities were given thorough consideration. These included the following:

1. Seismic - It is the opinion of the Consultation Team that no unfavorable impacts would result from seismic operations.

2. Oil Spills - Conceivably, a large oil spill occurring in the immediate vicinity of whales could be harmful because of the possible intake of oil through the blow hole, fouling of the baleen plates, and indirectly from the ingestion of oil contaminated food. However, endangered cetaceans are uncommon in the lease/sale area and are sighted only on rare occasions. Therefore, even if an oil spill occurred in the tract areas, it is unlikely that any endangerd whales will be affected. In addition, there is no historical record of such an occurrence.

3. Boat traffic - Due to the migratory nature of whales, the small increase in boat traffic would have a minimal (non-measurable) impact.

Turtles:

The following exploratory and production/development activities were reviewed to determine possible impacts on sea turtles and their critical habitat:

1. Seismic - None.

2. Oil spills - The effect of oil spills is not known. However, oil ingestion or physical contact by turtles, especially with the eyes and nostrils and particularly in hatchlings entrapped in a spill, could be lethal. Hatchling and juvenile turtles are believed to be passively distributed by surface currents, the same mechanism that spreads oil. None of the five species of sea turtles that are found in the Gulf of Mexico occur in concentrated numbers of assemblages in those waters, and oil spills in limited areas would not be expected to impact on more than a few individuals at sea. Oil spills, however, could have severe impacts on nesting beaches if washed ashore at nesting seasons. Therefore, every effort to minimize the potential for spills should be exercised.

3. Boat traffic - As with whales, the small increase in boat traffic would have a minimal impact on sea turtles.

4. Drilling - Platforms and pipelines may increase habitat by creating "live-bottom" topography. Turtles have been observed to feed on sessile organisms attached to platforms. During the period from mid-

summer to mid-fall, lights on drilling platforms near shore could attract hatchling turtles resulting in abnormal concentrations. These disoriented turtles would possibly be subjected to increased predation. It is recommended that monitoring of the effect of lights, particularly on hatchling loggerheads, be conducted to determine the significance of their impact.

Biological Determination and Need for Additional Information or Further Consultation:

After a careful review of the findings by the Consultation Team, it is my biological opinion that the proposed project is not likely to jeopardize the continued existence of the endangered or threatened species listed above or result in the destruction or adverse modification of habitats determined to be critical to them. This biological opinion is based on the general information in the EIS concerning possible effects of the proposed actions and does not relieve BLM or USGS of the continuing responsibility of reviewing their activities and programs in light of their Section 7 consultation should new information reveal impacts of the identified activities that may affect listed species or their habitats, or these activities are subsequently modified, or a new species is listed that may be affected.

APPENDIX 2 - Memorandum of Agreement, Departments of Defense and Interior

MEMORANDUM OF AGREEMENT BETWEEN THE DEPARTMENT OF DEFENSE AND THE DEPARTMENT OF THE INTERIOR ON MUTUAL CONCERNS ON THE OUTER CONTINENTAL SHELF

I. Declaration of Intent. We, the Secretary of Defense and the Secretary of the Interior, hereby agree to establish procedures for joint use of the Outer Continental Shelf (OCS). The Department of Defense (DOD) and Department of the Interior (DOI) fully support the national goal of exploration and development of our nation's offshore oil and gas resources. The DOD recognizes that the OCS leasing program of the Department of the Interior is an integral part of the nation's energy security program to develop domestic oil and gas resources and thus is important to national defense. The Department of the Interior fully supports the requirement for DOD to use the OCS for the national defense/security and to ensure that our armed forces achieve and maintain an optimum state of readiness. We acknowledge that from time to time and from place to place the requirements for mineral exploration/development and defense related activities may conflict. In these cases, we shall reach mutually acceptable solutions to the issues raised by these conflicting requirements, in accordance with the principles and procedures established by this memorandum.

II. Procedures. Our departments agree to follow the steps and the schedule listed below:

A. The Call for Information on a proposed planning area will initiate DOD participation in a particular sale cycle. At the time the Call is issued, separate notification will be made to the DOD Executive Agent for OCS matters and will include appropriate charts, coordinates defining boundaries of the proposed area, and other data deemed pertinent to DOD analysis of the area. The DOD Executive Agent will be provided with a list of blocks and appropriate maps constituting the offering proposal identified at the time of Area Identification.

B. Within one month following Area Identification, DOD will submit a statement, along with supporting rationale, on the proposed offering which defines areas it believes require deferral from the offering or military stipulations for joint use. DOI will respond within one month after the DOD submission with agreement to accommodate DOD position or with alternative proposals and supporting rationale.

C. The Director of the Minerals Management Service (on behalf of DOI) and the DOD Executive Agent (on behalf of DOD) shall meet within the ensuing four months to approve agreements reached under (B) above and to resolve any remaining conflicts prior to the proposed Notice of Offering.

D. Issues still in conflict will be resolved by the undersigned no later than 30 days after publication of the Proposed Notice of Offering.

E. Additionally, the procedures of this memorandum will be used to resolve any conflicts that exist in lease offerings presently in the planning process.

III. Areas on the OCS requiring deferral from lease offerings. Our departments agree that, balanced against the geologic potential of an area, certain defense-related activities on the OCS may be irreconcilable with mineral exploration/development and will, under the procedures established above, be deferred from the pending lease offering. These activities are defined under this agreement as those which must take place in a particular area of the OCS due to their relation to fixed monitoring or control stations which cannot be moved except at great expense and compromise of their mission; those which relate to sensitive operations of a classified nature; and those which pose a direct danger to mineral exploration/development structures and/or personnel. More particularly, in selected instances, these may include but are not limited to:

A. Research, development, testing and evaluation (RDT&E) ranges involving hazardous weapons, which encompass but are not limited to missiles activated by radar reflectivity or heat or errant missiles whose onboard sensors seek targets of opportunity.

B. Intense operations by air, surface, or subsurface units whose activities are hazardous to non-DOD structures, equipment, personnel and which if forced to take place in close proximity to such structures would also become hazardous to DOD ships and aircraft.

C. Certain classified activities which DOD will disclose to appropriately-cleared DOI personnel.

D. Submarine transit lanes.

IV. Areas on the OCS requiring lease stipulations and lessee advisories. Our departments agree that in certain specific instances, conflicts on the OCS can be mitigated by attaching general or site-specific stipulations as a part of lease agreements or including lessee advisories. These include but are not limited to standard military stipulations for military warning areas (hold harmless, electromagnetic emission and notice of operations) and special stipulations for shelter and evacuation, time-sharing provisions, and provisions for specialized underwater research activities.

V. Locus of discussions. All policy discussions and final agreements under this memorandum will be conducted in Washington, D.C., and environs, and all comment on their status or resolution will be handled by our two departments. Any public comments of a policy nature in conjunction with this agreement by officers or employees of our departments elsewhere are unauthorized.

VI. Duration of agreements under this memorandum. All deferrals, stipulations, and lessee advisories for a given area of the OCS will remain in effect for subsequent lease offerings in the same area unless altered by our two departments under the procedures outlined in this memorandum.

Caspar W Weinberger
Secretary of Defense
2 0 JUL 1983

James G. Watt
Secretary of Interior
JUL 20 1983